

MEDICAL CLASSICS

VOL 3

September, 1938

NO 1



CONTENTS

Works of Hippocrates

On Ancient Medicine - - - - -	1
On Airs, Waters, and Places - - - - -	19
The Book of Prognostics - - - - -	43
On Regimen in Acute Diseases - - - - -	60
Of the Epidemics - - - - -	100

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Introduction

ABOUT five hundred years before Christ, in the Golden Age of Greece, medicine was beginning to sever its direct connection with religion and its control by the priesthood. Health resorts were springing up along the sunny shores of the blue Aegean, on its numerous islands and farther inland toward the cooler mountains. These resorts were similar in some respects to the spas or watering places of today. The climate was healthful, hydrotherapy in many forms was practiced and the patient was taught to relax from the routine worries of life. Such resorts were controlled by priest-physicians, members of the Asclepiads, men who had dedicated their lives to Aesculapius, the God of Medicine. Knowledge gained was handed down from father to son and to a few "disciples bound by a stipulation and oath."

Into such a guild, at the famous health resort-medical school-hospital on the Island of Cos, in the fifth century B C, was born Hippocrates who became known as The Great or Hippocrates II, to distinguish him from four other physicians of the same name. Practically nothing is known of his life but many legends have sprung up about this great doctor and teacher.

Even two hundred years after his death, no one knew anything definite about Hippocrates' life. Stories were invented which told that he was the son of the physician Heraclides and his wife Phenarete. The date of his birth was placed in 460 B C. His first teacher was his father, followed by Herodicus, Gorgias the sophist, and Democritus the philosopher. After his schooling, he traveled widely and is supposed to have performed remarkable

cures in Thessaly, Abdera and Argos. In Athens he was given credit for bringing the plague under control and a monument was erected to his memory. Artaxerxes, king of Persia, wished to make Hippocrates his court physician but the doctor was a loyal Hellene. He may have died in Thessaly at the age of 104.

So much for fable. We do know that the Greeks who founded the Alexandrian library sought to gather all the knowledge of the ancients into one place. In the field of medicine they found several writings of Hippocrates who had been dead about two hundred years. The scholars knew that the medical information contained in these writings was unusual in its direct personal study of disease. Here were word pictures of sick men, careful descriptions of their appearances and a complete story of the onset, course and outcome of their diseases. This was progress away from the fatalistic attitude which gave a sacred or demoniacal cause of man's ill health. All medical writings which bore this stamp were classified under the name Hippocrates, whether he wrote a single line of them, we probably shall never know. Nor does it matter.

What is important is that the Hippocratic attitude toward medicine threw off the religious aspect of suffering and made a beginning toward the scientific study of disease. Clinical medicine had its inception and, aided in the intervening twenty-five hundred years by such men as Sydenham, Heberden, Charcot and Osler, has reached its present state.

English translations of Hippocrates were incomplete and unsatisfactory until The Sydenham Society of England commissioned Francis Adams, a Scottish surgeon, in the early nineteenth century, to make a translation. His book was first published in 1849, again in 1886 and in 1929. It is a scholarly work with numerous and extensive foot-notes. In the present edition most of the foot-notes have been deleted and a continuous and connected picture of medicine in the Golden Age of Greece is the result.

Concerning the authenticity of Hippocrates' own writings and of the Hippocratic collection, we will reproduce Francis Adams'

conclusions as found on pages 105 and 106 of volume I of *The Genuine Works of Hippocrates*, 1886

I will now briefly recapitulate the general results of the investigations on which I have been occupied

1 That all the authorities, ancient and modern, who have investigated the question regarding the genuineness of the works which have come down to us under the name of Hippocrates, are agreed that a considerable portion of them are not the productions of the author himself

2 That it is almost universally admitted that the following treatises are genuine, viz ·

The Prognostics
On Airs, etc
On Regimen in Acute Diseases
Seven of the Books of Aphorisms
Epidemics I and III
On the Articulations
On Fractures
On the Instruments of Reduction
The Oath

3 That the following treatises may be pretty confidently acknowledged as genuine, although the evidence in their favor is not so strong as it is with regard to the preceeding list.—

On Ancient Medicine
On the Surgery
The Law
On Ulcers
On Fistulæ
On Hemorrhoids
On the Sacred Disease

4 That as it certainly appears that the Book of Prognostics is composed, in a great measure, from the contents of the First “Prorrhetics” and the “Coacæ Prænotiones,” there can be little

or no doubt that these two treatises are more ancient than the time of Hippocrates

5 That although the exact time at which the Collection, as it now stands, was made out has never been determined in a very satisfactory manner, an examination of the contents of the different treatises leads to the conclusion that most of them represent pretty faithfully the opinions held by the family of Hippocrates and his immediate successors in the Coan school of medicine

6 That a few of them, and more especially the two important works "On Internal Affections," and "On Diseases," would appear to bear distinct traces of having emanated from the contemporary school of Cnidos

7 That although the Epistles and certain public documents usually published at the end of the Collection may justly be suspected of being spurious, there is undoubted evidence that they are of very ancient date, and were composed, most probably, within less than a hundred years after the death of Hippocrates, so that there is every reason for believing that they relate to real events in the life of our author, and not to fictitious as some have supposed.

THE OATH

I swear by Apollo the physician, and Æsculapius, and Health, and All-heal, and all the gods and goddesses, that, according to my ability and judgment, I will keep this Oath and this stipulation—to reckon him who taught me this Art equally dear to me as my parents, to share my substance with him, and relieve his necessities if required, to look upon his offspring in the same footing as my own brothers, and to teach them this art, if they shall wish to learn it, without fee or stipulation, and that by precept, lecture, and every other mode of instruction, I will impart a knowledge of the Art to my own sons, and those of my teachers, and to disciples bound by a stipulation and oath according to the law of medicine, but to none others. I will follow that system of regimen which, according to my ability and judgment, I consider for the benefit of my patients, and abstain from whatever is deleterious and mischievous. I will give no deadly medicine to any one if asked, nor suggest any such counsel, and in like manner I will not give to a woman a pessary to produce abortion. With purity and with holiness I will pass my life and practice my Art. I will not cut persons laboring under the stone, but will leave this to be done by men who are practitioners of this work. Into whatever houses I enter, I will go into them for the benefit of the sick, and will abstain from every voluntary act of mischief and corruption, and, further, from the seduction of females or males, of freemen and slaves. Whatever, in connection with my professional practice or not, in connection with it, I see or hear, in the life of men, which ought not to be spoken of abroad, I will not divulge, as reckoning that all such should be kept secret. While I continue to keep this Oath unviolated, may it be granted to me to enjoy life and the practice of the art, respected by all men, in all times! But should I trespass and violate this Oath, may the reverse be my lot!



On Ancient Medicine

WHOEVER having undertaken to speak or write on Medicine, have first laid down for themselves some hypothesis to their argument, such as hot, or cold, or moist, or dry, or whatever else they choose (thus reducing their subject within a narrow compass, and supposing only one or two original causes of diseases or of death among mankind), are all clearly mistaken in much that they say, and this is the more reprehensible as relating to an art which all men avail themselves of on the most important occasions, and the good operators and practitioners in which they hold in especial honor. For there are practitioners, some bad and some far otherwise, which, if there had been no such thing as Medicine, and if nothing had been investigated or found out in it, would not have been the case, but all would have been equally unskilled and ignorant of it, and everything concerning the sick would have been directed by chance. But now it is not so, for, as in all the other arts, those who practise them differ much from one another in dexterity and knowledge, so is it in like manner with Medicine. Wherefore I have not thought that it stood in need of an empty hypothesis, like those subjects which are occult and dubious, in attempting to handle which it is necessary to use some hypothesis, as, for example, with regard to things above us and things below the earth, if any one should treat of these and undertake to declare how they are constituted, the reader or hearer could not find out, whether what is delivered be true or false, for there is nothing which can be referred to in order to discover the truth.

2 But all these requisites belong of old to Medicine, and an origin and way have been found out, by which many and elegant

discoveries have been made, during a length of time, and others will yet be found out, if a person possessed of the proper ability, and knowing those discoveries which have been made, should proceed from them to prosecute his investigations. But whoever, rejecting and despising all these, attempts to pursue another course and form of inquiry, and says he has discovered anything, is deceived himself and deceives other, for the thing is impossible. And for what reason it is impossible, I will now endeavor to explain, by stating and showing what the art really is. From this it will be manifest that discoveries cannot possibly be made in any other way. And most especially, it appears to me, that whoever treats of this art should treat of things which are familiar to the common people. For of nothing else will such a one have to inquire or treat, but of the diseases under which the common people have labored, which diseases and the causes of their origin and departure, their increase and decline, illiterate persons cannot easily find out themselves, but still it is easy for them to understand these things when discovered and expounded by others. For it is nothing more than that every one is put in mind of what had occurred to himself. But whoever does not reach the capacity of the illiterate vulgar and fails to make them listen to him, misses his mark. Wherefore, then, there is no necessity for any hypothesis.

3 For the art of Medicine would not have been invented at first, nor would it have been made a subject of investigation (for there would have been no need of it), if when men are indisposed, the same food and other articles of regimen which they eat and drink when in good health were proper for them, and if no others were preferable to these. But now necessity itself made medicine to be sought out and discovered by men, since the same things when administered to the sick, which agreed with them when in good health, neither did nor do agree with them. But to go still further back, I hold that the diet and food which people in health now use would not have been discovered, provided it had suited with man to eat and drink in like manner as the ox, the horse, and all other animals, except man, do of the productions of the earth, such as fruits, weeds, and grass, for from such things these animals

grow, live free of disease, and require no other kind of food And, at first, I am of opinion that man used the same sort of food, and that the present articles of diet had been discovered and invented only after a long lapse of time, For when they suffered much and severely from this strong and brutish diet, swallowing things which were raw, unmixed, and possessing great strength, they became exposed to strong pains and diseases, and to early deaths It is likely, indeed, that from habit they would suffer less from these things then than we would now, but still they would suffer severely even then, and it is likely that the greater number, and those who had weaker constitutions, would all perish, whereas the stronger would hold out for a longer time, as even nowadays some, in consequence of using strong articles of food, get off with little trouble, but others with much pain and suffering From this necessity it appears to me that they would search out the food befitting their nature, and thus discover that which we now use and that from wheat, by macerating it, stripping it of its hull, grinding it all down, sifting, toasting, and baking it, they formed bread, and from barley they formed cake (*maza*), performing many operations in regard to it, they boiled, they roasted, they mixed, they diluted those things which are strong and of intense qualities with weaker things, fashioning them to the nature and powers of man, and considering that the stronger things Nature would not be able to manage if administered, and that from such things pains, diseases, and death would arise, but such as Nature could manage, that from them food, growth, and health, would arise To such a discovery and investigation what more suitable name could one give than that of *Medicine*? since it was discovered for the health of man, for his nourishment and safety, as a substitute for that kind of diet by which pains, diseases, and deaths were occasioned

4 And if this is not held to be an art, I do not object For it is not suitable to call any one an artist of that which no one is ignorant of, but which all know from usage and necessity But still the discovery is a great one, and requiring much art and investigation Wherefore those who devote themselves to gymnastics and training, are always making some new discovery, by

pursuing the same line of inquiry, where, by eating and drinking certain things, they are improved and grow stronger than they were

5 Let us inquire then regarding what is admitted to be Medicine, namely, that which was invented for the sake of the sick, which possesses a name and practitioners, whether it also seeks to accomplish the same objects, and whence it derived its origin. To me, then, it appears, as I said at the commencement, that nobody would have sought for medicine at all, provided the same kinds of diet had suited with men in sickness as in good health. Wherefore, even yet, such races of men as make no use of medicine, namely, barbarians, and even certain of the Greeks, live in the same way when sick as when in health, that is to say, they take what suits their appetite, and neither abstain from, nor restrict themselves in anything for which they have a desire. But those who have cultivated and invented medicine, having the same object in view as those of whom I formerly spoke, in the first place, I suppose, diminished the quantity of the articles of food which they used, and this alone would be sufficient for certain of the sick, and be manifestly beneficial to them, although not to all, for there would be some so affected as not to be able to manage even small quantities of their usual food, and as such persons would seem to require something weaker, they invented soups, by mixing a few strong things with much water, and thus abstracting that which was strong in them by dilution and boiling. But such as could not manage even soups, laid them aside, and had recourse to drinks, and so regulated them as to mixture and quantity, that they were administered neither stronger nor weaker than what was required.

6 But this ought to be well known, that soups do not agree with certain persons in their diseases, but, on the contrary, when administered both the fevers and the pains are exacerbated, and it becomes obvious that what was given has proved food and increase to the disease, but a wasting and weakness to the body. But whatever persons so affected partook of solid food, or cake, or bread, even in small quantity, would be ten times and more decidedly injured than those who had taken soups, for no other

reason than from the strength of the food in reference to the affection, and to whomsoever it is proper to take soups and not eat solid food, such a one will be much more injured if he eat much than if he eat little, but even little food will be injurious to him. But all the causes of the sufferance refer themselves to this rule, that the strongest things most especially and decidedly hurt man, whether in health or in disease.

7 What other object, then, had he in view who is called a physician, and is admitted to be a practitioner of the art, who found out the regimen and diet befitting the sick, than he who originally found out and prepared for all mankind that kind of food which we all now use, in place of the former savage and brutish mode of living? To me it appears that the mode is the same, and the discovery of a similar nature. The one sought to abstract those things which the constitution of man cannot digest, because of their wildness and intemperance, and the other those things which are beyond the powers of the affection in which any one may happen to be laid up. Now, how does the one differ from the other, except that the latter admits of greater variety, and requires more application, whereas the former was the commencement of the process?

8 And if one would compare the diet of sick persons with that of persons in health, he will find it not more injurious than that of healthy persons in comparison with that of wild beasts and of other animals. For, suppose a man laboring under one of those diseases which are neither serious and unsupportable, nor yet altogether mild, but such as that, upon making any mistake in diet, it will become apparent, as if he should eat bread and flesh, or any other of those articles which prove beneficial to healthy persons, and that, too, not in great quantity, but much less than he could have taken when in good health, and that another man in good health, having a constitution neither very feeble, nor yet strong, eats of those things which are wholesome and strengthening to an ox or a horse, such as vetches, barley, and the like, and that, too, not in great quantity, but much less than he could take, the healthy person who did so would be subjected to no less disturbance and danger than the sick person who took bread or

cake unseasonably All these things are proofs that Medicine is to be prosecuted and discovered by the same method as the other

9 And if it were simply, as is laid down, that such things as are stronger prove injurious, but such as are weaker prove beneficial and nourishing, both to sick and healthy persons, it were an easy matter, for then the safest rule would be to circumscribe the diet to the lowest point But then it is no less mistake, nor one that injures a man less, provided a deficient diet, or one consisting of weaker things than what are proper, be administered For, in the constitution of man, abstinence may enervate, weaken, and kill And there are many other ills, different from those of repletion, but no less dreadful, arising from deficiency of food, wherefore the practice in those cases is more varied, and requires greater accuracy For one must aim at attaining a certain measure, and yet this measure admits neither weight nor calculation of any kind, by which it may be accurately determined, unless it be the sensation of the body, wherefore it is a task to learn this accurately, so as not to commit small blunders either on the one side or the other, and in fact I would give great praise to the physician whose mistakes are small, for perfect accuracy is seldom to be seen, since many physicians seem to me to be in the same plight as bad pilots, who, if they commit mistakes while conducting the ship in a calm do not expose themselves, but when a storm and violent hurricane overtake them, they then, from their ignorance and mistakes, are discovered to be what they are, by all men, namely, in losing their ship And thus bad and commonplace physicians, when they treat men who have no serious illness, in which case one may commit great mistakes without producing any formidable mischief, (and such complaints occur much more frequently to men than dangerous ones) under these circumstances, when they commit mistakes, they do not expose themselves to ordinary men, but when they fall in with a great, a strong, and a dangerous disease, then their mistakes and want of skill are made apparent to all Their punishment is not far off, but is swift in overtaking both the one and the other ¹

¹ He means both the pilot and physician

10 And that no less mischief happens to a man from unseasonable depletion than from repletion, may be clearly seen upon reverting to the consideration of persons in health For, to some, with whom it agrees to take only one meal in the day, and they have arranged it so accordingly, whilst others, for the same reason, also take dinner, and thus they do because they find it good for them, and not like those persons who, for pleasure or from any casual circumstance, adopt the one or the other custom and to the bulk of mankind it is of little consequence which of these rules they observe, that is to say, whether they make it a paractice to take one or two meals But there are certain persons who cannot readily change their diet with impunity, and if they make any alteration in it for one day, or even for a part of a day, are greatly injured thereby Such persons, provided they take dinner when it is not their wont, immediately become heavy and inactive, both in body and mind, and are weighed down with yawning, slumbering, and thirst, and if they take supper in addition, they are seized with flatulence, tormina, and diarrhœa, and to many this has been the commencement of a serious disease, when they have merely taken twice in a day the same food which they have been in the custom of taking once And thus, also, if one who has been accustomed to dine, and this rule agrees with him, should not dine at the accustomed hour, he will straightway feel great loss of strength, trembling, and want of spirits, the eyes of such a person will become more pallid, his urine thick and hot, his mouth bitter, his bowels will seem, as it were, to hang loose, he will suffer from vertigo, lowness of spirit, and inactivity,—such are the effects, and if he should attempt to take at supper the same food which he was wont to partake of at dinner, it will appear insipid, and he will not be able to take it off, and these things, passing downwards with tormina and rumbling, burn up his bowels, he experiences insomnolency or troubled and disturbed dreams, and to many of them these symptoms are the commencement of some disease

11 But let us inquire what are the causes of these things which happened to them To him, then, who was accustomed to take only one meal in the day, they happened because he did not

wait the proper time, until his bowels had completely derived benefit from and had digested the articles taken at the preceding meal, and until his belly had become soft, and got into a state of rest, but he gave it a new supply while in a state of heat and fermentation, for such bellies digest much more slowly, and require more rest and ease. And as to him who had been accustomed to dinner, since, as soon as the body required food, and when the former meal was consumed, and he wanted refreshment, no new supply was furnished to it, he wastes and is consumed from want of food. For all the symptoms which I describe as befalling to this man I refer to want of food. And I also say that all men who, when in a state of health, remain for two or three days without food, experience the same unpleasant symptoms as those which I described in the case of him who had omitted to take dinner.

12 Wherefore, I say, that such constitutions as suffer quickly and strongly from errors in diet, are weaker than others that do not, and that a weak person is in a state very nearly approaching to one in disease, but a person in disease is the weaker, and it is, therefore, more likely that he should suffer if he encounters anything that is unseasonable. It is difficult, seeing that there is no such accuracy in the Art, to hit always upon what is most expedient, and yet many cases occur in medicine which would require this accuracy, as we shall explain. But on that account, I say, we ought not to reject the ancient Art, as if it were not, and had not been properly founded, because it did not attain accuracy in all things, but rather, since it is capable of reaching to the greatest exactitude by reasoning, to receive it and admire its discoveries, made from a state of great ignorance, and as having been well and properly made, and not from chance.

13 But I wish the discourse to revert to the new method of those who prosecute their inquiries in the Art by hypothesis. For if hot, or cold, or moist, or dry, be that which proves injurious to man, and if the person who would treat him properly must apply cold to the hot, hot to the cold, moist to the dry, and dry to the moist—let me be presented with a man, not indeed one of a strong constitution, but one of the weaker, and let him eat

wheat, such as it is supplied from the thrashing-floor, raw and unprepared, with raw meat, and let him drink water By using such a diet I know that he will suffer much and severely, for he will experience pains, his body will become weak, and his bowels deranged, and he will not subsist long What remedy, then, is to be provided for one so situated? Hot? or cold? or moist? or dry? For it is clear that it must be one or other of these For, according to this principle, if it is one of the which is injuring the patient, it is to be removed by its contrary But the surest and most obvious remedy is to change the diet which the person used, and instead of wheat to give bread, and instead of raw flesh, boiled, and to drink wine in addition to these, for by making these changes it is impossible but that he must get better, unless completely disorganized by time and diet What, then, shall we say? whether that, as he suffered from cold, these hot things being applied were of use to him, or the contrary? I should think this question must prove a puzzler to whomsoever it is put For whether did he who prepared bread out of wheat remove the hot, the cold, the moist, or the dry principle in it?—for the bread is consigned both to fire and to water, and is wrought with many things, each of which has its peculiar property and nature, some of which it loses, and with others it is diluted and mixed

14 And this I know, moreover, that to the human body it makes a great difference whether the bread be fine or coarse, of wheat with or without the hull, whether mixed with much or little water, strongly wrought or scarcely at all, baked or raw—and a multitude of similar differences, and so, in like manner, with the cake (*maza*), the powers of each, too, are great, and the one nowise like the other Whoever pays no attention to these things, or, paying attention, does not comprehend them, how can he understand the diseases which befall a man? For, by every one of these things, a man is affected and changed this way or that, and the whole of his life is subjected to them, whether in health, convalescence, or disease Nothing else, then, can be more important or more necessary to know than these things So that the first inventors, pursuing their investigations properly, and by a suitable train of reasoning, according to the nature of

man, made their discoveries, and thought the Art worthy of being ascribed to a god, as is the established belief For they did not suppose that the dry or the moist, the hot or the cold, or any of these are either injurious to man, or that man stands in need of them, but whatever in each was strong, and more than a match for a man's constitution, whatever he could not manage, that they held to be hurtful, and sought to remove Now, of the sweet, the strongest is that which is intensely sweet, of the bitter, that which is intensely bitter, of the acid, that which is intensely acid, and of all things that which is extreme, for these things they saw both existing in man, and proving injurious to him For there is in man the bitter and the salt, the sweet and the acid, the sour and the insipid, and a multitude of other things having all sorts of powers both as regards quantity and strength These, when all mixed and mingled up with one another, are not apparent, neither do they hurt a man, but when any of them is separate, and stands by itself, then it becomes perceptible, and hurts a man And thus, of articles of food, those which are unsuitable and hurtful to man when administered, every one is either bitter, or intensely so, or saltish or acid, or something else intense and strong, and therefore we are disordered by them in like manner as we are by the secretions in the body But all those things which a man eats and drinks are devoid of any such intense and well-marked quality, such as bread, cake, and many other things of a similar nature which man is accustomed to use for food, with the exception of condiments and confectionaries, which are made to gratify the palate and for luxury And from those things, when received into the body abundantly, there is no disorder nor dissolution of the powers belonging to the body, but strength, growth, and nourishment result from them, and this for no other reason than because they are well mixed, have nothing in them of an immoderate character, nor anything strong, but the whole forms one simple and not strong substance

15 I cannot think in what manner they who advance this doctrine, and transfer the Art from the cause I have described to hypothesis, will cure men according to the principle which they have laid down For, as far as I know, neither the hot nor the

cold, nor the dry, nor the moist, has ever been found unmixed with any other quality, but I suppose they use the same articles of meat and drink as all we other men do. But to this substance they give the attribute of being hot, to that cold, to that dry, and to that moist. Since it would be absurd to advise the patient to take something hot, for he would straightway ask what it is? so that he must either play the fool, or have recourse to some one of the well-known substances, and if this hot thing happen to be sour, and that hot thing insipid, and this hot thing has the power of raising a disturbance in the body (and there are many other kinds of heat, possessing many opposite powers), he will be obliged to administer some one of them, either the hot and the sour, or the hot and the insipid, or that which, at the same time, is cold and sour (for there is such a substance), or the cold and the insipid. For, as I think, the very opposite effects will result from either of these, not only in man, but also in a bladder, a vessel of wood, and in many other things possessed of far less sensibility than man, for it is not the heat which is possessed of great efficacy, but the sour and the insipid, and other qualities as described by me, both in man and out of man, and that whether eaten or drunk, rubbed in externally, and otherwise applied.

16 But I think that of all the qualities heat and cold exercise the least operation in the body, for these reasons: as long time as hot and cold are mixed up with one another they do not give trouble, for the cold is attempered and rendered more moderate by the hot, and the hot by the cold, but when the one is wholly separate from the other, then it gives pain, and at that season when cold is applied it creates some pain to a man, but quickly, for that very reason, heat spontaneously arises in him without requiring any aid or preparation. And these things operate thus both upon men in health and in disease. For example, if a person in health wishes to cool his body during winter, and bathes either in cold water or in any other way, the more he does this, unless his body be fairly congealed, when he resumes his clothes and comes into a place of shelter, his body becomes more heated than before. And thus, too, if a person wish to be warmed thoroughly either by means of a hot bath or strong fire, and straight-

way having the same clothing on, takes up his abode again in the place he was in when he became congealed, he will appear much colder, and more disposed to chills than before. And if a person fan himself on account of a suffocating heat, and having procured refrigeration for himself in this manner, cease doing so, the heat and suffocation will be ten times greater in his case than in that of a person who does nothing of the kind. And, to give a more striking example, persons travelling in the snow, or otherwise in rigorous weather, and contracting great cold in their feet, their hands, or their head, what do they not suffer from inflammation and tingling when they put on warm clothing and get into a hot place? In some instances, blisters arise as if from burning with fire, and they do not suffer from any of those unpleasant symptoms until they become heated. So readily does either of these pass into the other, and I could mention many other examples. And with regard to the sick, is it not in those who experience a rigor that the most acute fever is apt to break out? And yet not so strongly neither, but that it ceases in a short time, and, for the most part, without having occasioned much mischief, and while it remains, it is hot, and passing over the whole body, ends for the most part in the feet, where the chills and cold were most intense and lasted longest, and, when sweat supervenes, and the fever passes off, the patient is much colder than if he had not taken the fever at all. Why then should that which so quickly passes into the opposite extreme, and loses its own powers spontaneously, be reckoned a mighty and serious affair? And what necessity is there for any great remedy for it?

17 One might here say—but persons in ardent fevers, pneumonia, and other formidable diseases, do not quickly get rid of the heat, nor experience these rapid alterations of heat and cold. And I reckon this very circumstance the strongest proof that it is not from heat simply that men get into the febrile state, neither is it the sole cause of the mischief, but that this species of heat is bitter, and that acid, and the other saltish, and many other varieties, and again there is cold combined with other qualities. These are what proves injurious, heat, it is true, is present also, possessed of strength as being that which conducts, is exacerbated and

increased along with the other, but has no power greater than what is peculiar to itself

18 With regard to these symptoms, in the first place those are most obvious of which we have all often had experience. Thus, then, in such of us as have a coryza and defluxion from the nostrils, this discharge is much more acrid than that which formerly was formed in and ran from them daily, and it occasions swelling of the nose, and it inflames, being of a hot and extremely ardent nature, as you may know, if you apply your hand to the place, and, if the disease remains long, the part becomes ulcerated although destitute of flesh and hard, and the heat in the nose ceases, not when the defluxion takes place and the inflammation is present, but when the running becomes thicker and less acrid, and more mixed with the former secretion, then it is that the heat ceases. But in all those cases in which this decidedly proceeds from cold alone, without the concurrence of any other quality, there is a change from cold to hot, and from hot to cold, and these quickly supervene, and require no coction. But all the others being connected, as I have said, with acrimony and intemperance of humors, pass off in this way by being mixed and concocted.

19 But such defluxions as are determined to the eyes being possessed of strong and varied acrimonies, ulcerate the eyelids, and in some cases corrode the cheeks and parts below the eyes upon which the flow, and even occasion rupture and erosion of the tunic which surrounds the eyeball. But pain, heat, and extreme burning prevail until the defluxions are concocted and become thicker, and concretions form about the eyes, and the coction takes place from the fluids being mixed up, diluted, and digested together. And in defluxions upon the throat, from which are formed hoarseness, cynanche, corysypelas, and pneumonia, all these have at first saltish, watery, and acrid discharges, and with these the diseases gain strength. But when the discharges become thicker, more concocted, and are freed from all acrimony, then, indeed, the fevers pass away, and the other symptoms which annoyed the patient, for we must account those things the cause of each complaint, which, being present in a certain fashion, the complaint exists, but it ceases when they

change to another combination But those which originate from pure heat or cold, and do not participate in any other quality, will then cease when they undergo a change from cold to hot, and from hot to cold, and they change in the manner I have described before Wherefore, all the other complaints to which man is subject arise from powers (qualities?) Thus, when there is an overflow of the bitter principle, which we call yellow bile, what anxiety, burning heat, and loss of strength prevail! but if relieved from it, either by being purged spontaneously, or by means of a medicine seasonably administered, the patient is decidedly relieved of the pains and heat, but while these things float on the stomach, unconcocted and undigested, no contrivance could make the pains and fever cease, and when there are acidities of an acrid and æruginous character, what varieties of frenzy, gnawing pains in the bowels and chest, and inquietude, prevail! and these do not cease until the acidities be purged away, or are calmed down and mixed with other fluids The coction, change, attenuation, and thickening into the form of humors, take place through many and various forms, therefore the crises and calculations of time are of great importance in such matters, but to all such changes hot and cold are but little exposed, for these are neither liable to putrefaction nor thickening What then shall we say of the change? that it is a combination (crasis) of these humors having different powers toward one another But the hot does not lose its heat when mixed with any other thing except the cold, nor again, the cold, except when mixed with the hot But all other things connected with man become the more mild and better in proportion as they are mixed with the more things besides But a man is in the best possible state when they are concocted and at rest, exhibiting no one peculiar quality, but I think I have said enough in explanation of them

20 Certain sophists and physicians say that it is not possible for any one to know medicine who does not know what man is [and how he was made and how constructed], and that whoever would cure men properly, must learn this in the first place But this saying rather appertains to philosophy, as Empedocles and certain others have described what man in his origin is, and how

he first was made and constructed But I think whatever such has been said or written by sophist or physician concerning nature has less connection with the art of medicine than with the art of painting And I think that one cannot know anything certain respecting nature from any other quarter than from medicine, and that this knowledge is to be attained when one comprehends the whole subject of medicine properly, but not until then, and I say that this history shows what man is, by what causes he was made, and other things accurately Wherefore it appears to me necessary to every physician to be skilled in nature, and strive to know, if he would wish to perform his duties, what man is in relation to the articles of food and drink, and to his other occupations, and what are the effects of each of them to every one And it is not enough to know simply that cheese is a bad article of food, as disagreeing with whoever eats of it to satiety, but what sort of disturbance it creates, and wherefore, and with what principle in man it disagrees, for there are many other articles of food and drink naturally bad which affect man in a different manner Thus, to illustrate my meaning by an example, undiluted wine drunk in large quantity renders a man feeble, and everybody seeing this knows that such is the power of wine, and the cause thereof, and we know, moreover, on what parts of a man's body it principally exerts its action, and I wish the same certainty to appear in other cases For cheese (since we used it as an example) does not prove equally injurious to all men, for there are some who can take it to satiety without being hurt by it in the least, but, on the contrary, it is wonderful what strength it imparts to those it agrees with, but there are some who do not bear it well, their constitutions are different, and they differ in this respect, that what in their body is incompatible with cheese, is roused and put in commotion by such a thing, and those in whose bodies such a humor happens to prevail in greater quantity and intensity, are likely to suffer the more from it But if the thing had been pernicious to the whole nature of man, it would have hurt all Whoever knows these things will not suffer from it

[21 During convalescence from diseases, and also in protracted

diseases, many disorders occur, some spontaneously, and some from certain things accidentally administered I know that the common herd of physicians, like the vulgar, if there happen to have been any innovation made about that day, such as the bath being used, a walk taken, or any unusual food eaten, all which were better done than otherwise, attribute notwithstanding the cause of these disorders, to some of these things, being ignorant of the true cause but proscribing what may have been very proper Now this ought not to be so, but one should know the effects of a bath or a walk unseasonably applied, for thus there will never be any mischief from these things, nor from any other thing, nor from repletion, nor from such and such an article of food Whoever does not know what effect these things produce upon a man, cannot know the consequences which result from them, nor how to apply them

22 And it appears to me that one ought also to know what diseases arise in man from the powers, and what from the structures What do I mean by this? By powers, I mean intense and strong juices, and by structures, whatever conformations there are in man For some are hollow, and from broad contracted into narrow, some expanded, some hard and round, some broad and suspended,² some stretched, some long, some dense, some rare and succulent,³ some spongy and of loose texture⁴ Now, then, which of these figures is the best calculated to suck to itself and attract humidity from another body? Whether what is hollow and expanded, or what is solid and round, or what is hollow, and from broad, gradually turning narrow? I think such as from hollow and broad are contracted into narrow this may be ascertained otherwise from obvious facts thus, if you gape wide with the mouth you cannot draw in any liquid, but by protruding, contracting, and compressing the lips, and still more by using a tube, you can readily draw in whatever you wish And thus, too, the instruments which are used for cupping are broad below and gradually become narrow, and are so con-

² Meaning probably the diaphragm, with its membranes

³ Meaning the mammæ, according to Heurnius

⁴ Such as the spleen and lungs

structed in order to suck and draw in from the fleshy parts. The nature and construction of the parts within a man are of a like nature, the bladder, the head, the uterus in woman, these parts clearly attract, and are always filled with a juice which is foreign to them. Those parts which are hollow and expanded are most likely to receive any humidity flowing into them, but cannot attract it in like manner. Those parts which are solid and round could not attract a humidity, nor receive it when it flows to them, for it would glide past, and find no place of rest on them. But spongy and rare parts, such as the spleen, the lungs, and the breasts, drink up especially the juices around them, and become hardened and enlarged by the accession of juices. Such things happen to these organs especially. For it is not with the spleen as with the stomach, in which there is a liquid, which it contains and evacuates every day, but when it (the spleen) drinks up and receives a fluid into itself, the hollow and lax parts of it are filled, even the small interstices, and, instead of being rare and soft, it becomes hard and dense, and it can neither digest nor discharge its contents. These things it suffers, owing to the nature of its structure. Those things which engender flatulence or tormina in the body, naturally do so in the hollow and broad parts of the body, such as the stomach and chest, where they produce rumbling noises, for when they do not fill the parts so as to be stationary, but have changes of place and movements, there must necessarily be noise and apparent movements from them. But such parts as are fleshy and soft, in these there occur torpor and obstructions, such as happen in apoplexy. But when it (the flatus) encounters a broad and resisting structure, and rushes against such a part, and this happens when it is by nature not strong so as to be able to withstand it without suffering injury, nor soft and rare, so as to receive or yield to it, but tender, juicy, full of blood, and dense, like the liver, owing to its density and broadness, it resists and does not yield. But flatus, when it obtains admission, increases and becomes stronger, and rushes toward any resisting object, but owing to its tenderness, and the quantity of blood which it (the liver) contains, it cannot be without uneasiness, and for these reasons the most acute and frequent

pains occur in the region of it, along with suppurations and chronic tumors (phymata) These symptoms also occur in the site of the diaphragm, but much less frequently, for the diaphragm is a broad, expanded, and resisting substance, of a nervous (tendinous?) and strong nature, and therefore less susceptible of pain, and yet pains and chronic abscesses do occur about it

23 There are both within and without the body many other kinds of structure, which differ much from one another as to sufferings both in health and disease, such as whether the head be small or large, the neck slender or thick, long or short, the belly long or round, the chest and ribs broad or narrow, and many others besides, all which you ought to be acquainted with, and their differences, so that knowing the causes of each, you may make the more accurate observations

24 And, as has been formerly stated, one ought to be acquainted with the powers of juices, and what action each of them has upon man, and their alliances towards one another What I say is this if a sweet juice change to another kind, not from any admixture, but because it has undergone a mutation within itself, what does it first become?—bitter? salt? austere? or acid? I think acid And hence, an acid juice is the most improper of all things that can be administered in cases in which a sweet juice is the most proper Thus, if one should succeed in his investigations of external things, he would be the better able always to select the best, for that is best which is farthest removed from that which is unwholesome



On Airs, Waters, and Places

WHOEVER wishes to investigate medicine properly, should proceed thus in the first place to consider the seasons of the year, and what effects each of them produces (for they are not at all alike, but differ much from themselves in regard to their changes) ¹ Then the winds, the hot and the cold, especially such as are common to all countries, and then such as are peculiar to each locality We must also consider the qualities of the waters, for as they differ from one another in taste and weight, so also do they differ much in their qualities In the same manner, when one comes into a city to which he is a stranger, he ought to consider its situation, how it lies as to the winds and the rising of the sun, for its influence is not the same whether it lies to the north or the south, to the rising or to the setting sun These things one ought to consider most attentively, and concerning the waters which the inhabitants use, whether they be marshy and soft, or hard, and running from elevated and rocky situations, and then if saltish and unfit for cooking, and the ground, whether it be naked and deficient in water, or wooded and well watered, and whether it lies in a hollow, confined situation, or is elevated and cold, and the mode in which the inhabitants live, and what are their pursuits, whether they are fond of drinking and eating to excess, and given to indolence, or are fond of exercise and labor, and not given to excess in eating and drinking

¹The part in parenthesis is rather obscure In the old French translation it is rendered thus "Elles sont très différentes entre elles par leur nature, et il arrive d'ailleurs une infinité de changemens qui sont tous divers" On these changes, see Aphor III, 2-15

2 From these things he must proceed to investigate everything else. For if one knows all these things well, or at least the greater part of them, he cannot miss knowing, when he comes into a strange city, either the diseases peculiar to the place, or the particular nature of common diseases, so that he will not be in doubt as to the treatment of the diseases, or commit mistakes, as is likely to be the case provided one had not previously considered these matters. And in particular, as the season and the year advances, he can tell what epidemic diseases will attack the city, either in summer or in winter, and what each individual will be in danger of experiencing from the change of regimen. For knowing the changes of the seasons, the risings and settings of the stars, how each of them takes place, he will be able to know beforehand what sort of a year is going to ensue. Having made these investigations, and knowing beforehand the seasons, such a one must be acquainted with each particular, and must succeed in the preservation of health, and be by no means unsuccessful in the practice of his art. And if it shall be thought that these things belong rather to meteorology, it will be admitted, on second thoughts, that astronomy contributes not a little, but a very great deal, indeed, to medicine. For with the seasons the digestive organs of men undergo a change.

3 But how each of the aforementioned things should be investigated and explained, I will now declare in a clear manner. A city that is exposed to hot winds (these are between the wintry rising, and the wintry setting of the sun), and to which these are peculiar, but which is sheltered from the north winds, in such a city the waters will be plenteous and saltish, and as they run from an elevated source, they are necessarily hot in summer, and cold in winter, the heads of the inhabitants are of a humid and pituitous constitution, and their bellies subject to frequent disorders, owing to the phlegm running down from the head, the forms of their bodies, for the most part, are rather flabby, they do not eat nor drink much, drinking wine in particular, and more especially if carried to intoxication, is oppressive to them, and the following diseases are peculiar to the district. In the first place, the women are sickly and subject to excessive menstrua-

tion, then many are unfruitful from disease, and not from nature, and they have frequent miscarriages, infants are subject to attacks of convulsions and asthma, which they consider to be connected with infancy, and hold to be a sacred disease (epilepsy). The men are subject to attacks of dysentery, diarrhea, hepialus,² chronic fevers in winter, of epinyctis,³ frequently, and of hemorrhoids about the anus. Pleurisies, peripneumonies, ardent fevers, and whatever diseases are reckoned acute, do not often occur, for such diseases are not apt to prevail where the bowels are loose. Ophthalmies occur of a humid character, but not of a serious nature, and of short duration, unless they attack epidemically from the change of the seasons. And when they pass their fiftieth year, defluxions supervening from the brain, render them paralytic when exposed suddenly to strokes of the sun, or to cold. These diseases are endemic to them, and, moreover, if any epidemic disease connected with the change of the seasons, prevail, they are also liable to it.

4 But the following is the condition of cities which have the opposite exposure, namely, to cold winds, between the summer settings and the summer risings of the sun, and to which these winds are peculiar, and which are sheltered from the south and the hot breezes. In the first place the waters are, for the most part, hard and cold. The men must necessarily be well braced and slender, and they must have the discharges downwards of the alimentary canal hard, and of difficult evacuation, while those upwards are more fluid, and rather bilious than pituitous. Their heads are sound and hard, and they are liable to burstings (of vessels²) for the most part. The diseases which prevail epidemically with them, are pleurisies, and those which are called acute diseases. This must be the case when the bowels are bound, and from any causes, many become affected with suppurations in the lungs, the cause of which is the tension of the body, and hardness of the bowels, for their dryness and the

² The Hepialus is a species of intermittent fever, very common in warm climates. It would appear to be a variety of the quotidian. See PAULUS ÆGINETA, Vol. I, 252, Syd Soc edition.

³ Frequent mention of this disease of the skin occurs in the works of the ancient writers on medicine.

coldness of the water dispose them to ruptures (of vessels?) Such constitutions must be given to excess of eating, but not of drinking, for it is not possible to be gourmands and drunkards at the same time Ophthalmies, too, at length supervene, these being of a hard and violent nature, and soon ending in rupture of the eyes, persons under thirty years of age are liable to severe bleedings at the nose in summer, attacks of epilepsy are rare but severe Such people are likely to be rather long-lived, their ulcers are not attended with serous discharges, nor of a malignant character, in disposition they are rather ferocious than gentle The diseases I have mentioned are peculiar to the men, and besides they are liable to any common complaint which may be prevailing from the changes of the seasons But the women, in the first place, are of a hard constitution, from the waters being hard, indigestible, and cold, and their menstrual discharges are not regular, but in small quantity, and painful Then they have difficult parturition, but are not very subject to abortions And when they do bring forth children, they are unable to nurse them, for the hardness and indigestible nature of the water puts away their milk Phthisis frequently supervenes after childbirth, for the efforts of it frequently bring on ruptures and strains Children while still little are subject to dropsies in the testicles, which disappear as they grow older, in such a town they are late in attaining manhood It is, as I have now stated, with regard to hot and cold winds and cities thus exposed

5 Cities that are exposed to winds between the summer and the winter risings of the sun, and those the opposite to them, have the following characters —Those which lie to the rising of the sun are all likely to be more healthy than such as are turned to the North, or those exposed to the hot winds, even if there should not be a furlong between them In the first place, both the heat and cold are more moderate Then such waters as flow to the rising sun, must necessarily be clear, fragrant, soft, and delightful to drink, in such a city For the sun in rising and shining upon them purifies them, by dispelling the vapors which generally prevail in the morning The persons of the inhabitants are, for the most part, well colored and blooming, unless some

disease counteract The inhabitants have clear voices, and in temper and intellect are superior to those which are exposed to the north, and all the productions of the country in like manner are better A city so situated resembles the spring as to moderation between heat and cold, and the diseases are few in number, and of a feeble kind, and bear a resemblance to the diseases which prevail in regions exposed to hot winds The women there are very prolific, and have easy deliveries Thus it is with regard to them

6 But such cities as lie to the west, and which are sheltered from winds blowing from the east, and which the hot winds and the cold winds of the north scarcely touch, must necessarily be in a very unhealthy situation in the first place the waters are not clear, the cause of which is, because the mist prevails commonly in the morning, and it is mixed up with the water and destroys its clearness, for the sun does not shine upon the water until he be considerably raised above the horizon And in summer, cold breezes from the east blow and dews fall, and in the latter part of the day the setting sun particularly scorches the inhabitants, and therefore they are pale and enfeebled, and are partly subject to all the aforesaid diseases, but no one is peculiar to them Their voices are rough and hoarse owing to the state of the air, which in such a situation is generally impure and unwholesome, for they have not the northern winds to purify it, and these winds they have are of a very humid character, such being the nature of the evening breezes Such a situation of a city bears a great resemblance to autumn as regards the changes of the day, inasmuch as the difference between morning and evening is great So it is with regard to the winds that are conducive to health, or the contrary

7 And I wish to give an account of the other kinds of waters, namely, of such as are wholesome and such as are unwholesome, and what bad and what good effects may be derived from water, for water contributes much towards health Such waters then as are marshy, stagnant, and belong to lakes, are necessarily hot in summer, thick, and have a strong smell, since they have no current, but being constantly supplied by rain-water, and the

sun heating them, they necessarily want their proper color, are unwholesome and form bile, in winter, they become congealed, cold, and muddy with the snow and ice, so that they are most apt to engender phlegm, and bring on hoarseness, those who drink them have large and obstructed spleens, their bellies are hard, emaciated, and hot, and their shoulders, collar-bones, and faces are emaciated, for their flesh is melted down and taken up by the spleen, and hence they are slender, such persons then are voracious and thirsty, their bellies are very dry both above and below, so that they require the strongest medicines ⁴ This disease is habitual to them both in summer and in winter, and in addition they are very subject to dropsies of a most fatal character, and in summer dysenteries, diarrhoeas, and protracted quartan fevers frequently seize them, and these diseases when prolonged dispose such constitutions to dropsies, and thus prove fatal These are the diseases which attack them in summer, but in winter younger persons are liable to pneumonia, and maniacal affections, and older persons to ardent fevers, from hardness of the belly Women are subject to œdema and leucophlegmasiæ, ⁵ when pregnant they have difficult deliveries, their infants are large and swelled, and then during nursing they become wasted and sickly, and the lochial discharge after parturition does not proceed properly with the women The children are particularly subject to hernia, and adults to varices and ulcers on their legs, so that persons with such constitutions cannot be long-lived, but before the usual period they fall into a state of premature old age And further, the women appear to be with child, and when the time of parturition arrives, the fulness of the belly disappears, and this happens from dropsy of the uterus Such waters then I reckon bad for every purpose The next to them in badness are those which have their fountains in rocks, so that they must necessarily be hard, or come from a soil which produces thermal waters, such as those having iron,

⁴ It can scarcely admit of a doubt that our author here alludes to scurvy

⁵ The leucophlegmasia is treated of in different parts of the Hippocratic treatises, as Aphor vii, 29, de Morb ii By it he evidently meant a species of dropsy

copper, silver, gold, sulphur, alum, bitumen, or nitre (soda) in them, for all these are formed by the force of heat. Good waters cannot proceed from such a soil, but those that are hard and of a heating nature, difficult to pass by urine, and of difficult evacuation by the bowels. The best are those which flow from elevated grounds, and hills of earth, these are sweet, clear, and can bear a little wine, they are hot in summer and cold in winter, for such necessarily must be the waters from deep wells. But those are most to be commended which run to the rising of the sun, and especially to the summer sun, for such are necessarily more clear, fragrant, and light. But all such as are selfish, crude, and hard, are not good for drink. But there are certain constitutions and diseases with which such waters agree when drunk, as I will explain presently. Their characters are as follows: the best are such as have their fountains to the east, the next, those between the summer risings and settings of the sun, and especially those to the risings, and third, those between the summer and winter settings, but the worst are those to the south, and the parts between the winter rising and setting, and those to the south are very bad, but those to the north are better. They are to be used as follows: whoever is in good health and strength need not mind, but may always drink whatever is at hand. But whoever wishes to drink the most suitable for any disease, may accomplish his purpose by attending to the following directions. To persons whose bellies are hard and easily burnt up, the sweetest, the lightest, and the most limpid waters will be proper, but those persons whose bellies are soft, loose, and pituitous, should choose the hardest, those kinds that are most crude, and the saltest, for thus will they be most readily dried up, for such waters as are adapted for boiling, and are of a very solvent nature, naturally loosen readily and melt down the bowels, but such as are intractable, hard, and by no means proper for boiling, these rather bind and dry up the bowels. People have deceived themselves with regard to salt waters, from inexperience, for they think these waters purgative, whereas they are the very reverse, for such waters are crude, and ill adapted

for boiling, so that the belly is more likely to be bound up than loosened by them And thus it is with regard to the waters of springs

8 I will now tell how it is with respect to rain-water, and water from snow Rain waters, then, are the lightest, the sweetest, the thinnest, and the clearest, for originally the sun raises and attracts the thinnest and lightest part of the water, as is obvious from the nature of salts, for the saltish part is left behind owing to its thickness and weight, and forms salts, but the sun attracts the thinnest part, owing to its lightness, and he abstracts this not only from the lakes, but also from the sea, and from all things which contain humidity, and there is humidity in everything, and from man himself the sun draws off the thinnest and lightest part of the juices As a strong proof of this, when a man walks in the sun, or sits down having a garment on, whatever parts of the body the sun shines upon do not sweat, for the sun carries off whatever sweat makes its appearance, but those parts which are covered by the garment, or anything else, sweat, for the particles of sweat are drawn and forced out by the sun, and are preserved by the cover so as not to be dissipated by the sun, but when the person comes into the shade the whole body equally perspires, because the sun no longer shines upon it Wherefore, of all kinds of water, these spoil the soonest, and rain water has a bad smell, because its particles are collected and mixed together from most objects, so as to spoil the soonest And in addition to this, when attracted and raised up, being carried about and mixed with the air, whatever part of it is turbid and darkish is separated and removed from the other, and becomes cloud and mist, but the most attenuated and lightest part is left, and becomes sweet, being heated and concocted by the sun, for all other things when concocted become sweet While dissipated then and not in a state of consistence it is carried aloft But when collected and condensed by contrary winds, it falls down wherever it happens to be most condensed For this is likely to happen when the clouds being carried along and moving with a wind which does not allow them to rest, suddenly encounters another wind and

other clouds from the opposite direction there it is first condensed, and what is behind is carried up to the spot, and thus it thickens, blackens, and is conglomerated, and by its weight it falls down and becomes rain. Such, to all appearance, are the best of waters, but they require to be boiled and strained, for otherwise they have a bad smell, and occasion hoarseness and thickness of the voice to those who drink them. Those from snow and ice are all bad, for when once congealed, they never again recover their former nature, for whatever is clear, light, and sweet in them, is separated and disappears, but the most turbid and weightiest part is left behind. You may ascertain this in the following manner. If in winter you will pour water by measure into a vessel and expose it to the open air until it is all frozen, and then on the following day bring it into a warm situation where the ice will thaw, if you will measure the water again when dissolved you will find it much less in quantity. This is a proof that the lightest and thinnest part is dissipated and dried up by the congelation, and not the heaviest and thickest, for that is impossible. wherefore I hold that waters from snow and ice, and those allied to them, are the worst of any for all purposes whatever. Such are the characters of rain-water, and those from ice and snow ;

9⁶ Men become affected with the stone, and are seized with diseases of the kidneys, strangury, sciatica, and become ruptured, when they drink all sorts of waters, and those from great rivers into which other rivulets run, or from a lake into which many streams of all sorts flow, and such as are brought from a considerable distance. For it is impossible that such waters can resemble one another, but one kind is sweet, another saltish and aluminous, and some flow from thermal springs, and these being all mixed up together disagree, and the strongest part always

⁶ This is a most interesting chapter, as containing the most ancient observations which we possess on the important subject of urinary calculi. The ancients never improved the theory, nor added much to the facts which are here stated by our author. We have given the summary of their opinions in the Commentary on PAULUS ÆGINETA, B III, 45. I would beg leave to remark that, notwithstanding the number of curious facts which modern chemistry has evolved regarding the composition of urinary calculi, the etiology of the disease is nearly as obscure now as it was in the days of Hippocrates.

prevails, but the same kind is not always the strongest, but sometimes one and sometimes another, according to the winds, for the north wind imparts strength to this water, and the south to that, and so also with regard to the others. There must be deposits of mud and sand in the vessels from such waters, and the aforesaid diseases must be engendered by them when drunk, but why not to all I will now explain. When the bowels are loose and in a healthy state,⁷ and when the bladder is not hot, nor the neck of the bladder very contracted, all such persons pass water freely, and no concretion forms in the bladder, but those in whom the belly is hot, the bladder must be in the same condition, and when preternaturally heated, its neck becomes inflamed, and when these things happen, the bladder does not expel the urine, but raises its heat excessively. And the thinnest part of it is secreted, and the purest part is passed off in the form of urine, but the thickest and most turbid part is condensed and concreted, at first in small quantity, but afterwards in greater, for being rolled about in the urine, whatever is of a thick consistence it assimilates to itself, and thus it increases and becomes indurated. And when such persons make water, the stone forced down by the urine falls into the neck of the bladder and stops the urine, and occasions intense pain, so that calculous children rub their privy parts and tear at them, as supposing that the obstruction to the urine is situated there. As a proof that it is as I say, persons affected with calculus have very limpid urine, because the thickest and foulest part remains and is concreted. Thus it generally is in cases of calculus. It forms also in children from milk, when it is not wholesome, but very hot and bilious, for it heats the bowels and bladder, so that the urine being also heated undergoes the same change. And I hold that it is better to give children only the most diluted wine, for such will least burn up and dry the veins. Calculi do not form so readily in women, for in them the urethra is short and wide, so that in them the urine is easily expelled, neither do they rub the pudendum with their hands, nor handle

⁷ Coray remarks that Prosper Martian, in his commentary on this passage, confirms the truth of the observation here made, that persons affected with calculus have the bowels constipated.

the passage like males, for the urethra in women opens direct into the pudendum, which is not the case with men, neither in them is the urethra so wide, and they drink more than children do. Thus, or nearly so, is it with reward to them

10 And respecting the seasons, one may judge whether the year will prove sickly or healthy from the following observations ^a—If the appearances connected with the rising and setting stars be as they should be, if there be rains in autumn, if the winter be mild, neither very tepid nor unseasonably cold, and if in spring the rains be seasonable, and so also in summer, the year is likely to prove healthy. But if the winter be dry and northerly, and the spring showery and southerly, the summer will necessarily be of a febrile character, and give rise to ophthalmies and dysenteries. For when suffocating heat sets in all of a sudden, while the earth is moistened by the vernal showers, and by the south wind, the heat is necessarily doubled from the earth, which is thus soaked by rain and heated by a burning sun, while, at the same time, men's bellies are not in an orderly state, nor the brain properly dried, for it is impossible, after such a spring, but that the body and its flesh must be loaded with humors, so that very acute fevers will attack all, but especially those of a phlegmatic constitution. Dysenteries are also likely to occur to women and those of a very humid temperament. And if at the rising of the Dogstar rain and wintry storms supervene, and if the etesian winds blow, there is reason to hope that these diseases will cease, and that the autumn will be healthy, but if not, it is likely to be a fatal season to children and women, but least of all to old men, and that convalescents will pass into quartans, and from quartans into dropsies, but if the winter be southerly, showery and mild, but the spring northerly, dry, and of a wintry character, in the first place women who happen to be with child, and whose accouchement should take place in spring, are apt to miscarry, and such as bring forth, have feeble and sickly children, so that they either die presently or are

^a Coray makes the following remarks on the natural characters of the seasons in Greece. The natural temperature of the winter in Greece was cold and humid, thus a dry and northerly winter was reckoned an unnatural season. Spring was reckoned unnatural when the heat and rain were excessive.

tender, feeble, and sickly, if they live. Such is the case with the women. The others are subject to dysenteries and dry ophthalmies, and some have catarrhs beginning in the head and descending to the lungs. Men of a phlegmatic temperament are likely to have dysenteries, and women, also, from the humidity of their nature, the phlegm descending downwards from the brain, those who are bilious, too, have dry ophthalmies from the heat and dryness of their flesh, the aged, too, have catarrhs from their flabbiness and melting of the veins, so that some of them die suddenly and some become paralytic on the right side or the left. For when, the winter being southerly and the body hot, the blood and veins are not properly constricted, a spring that is northerly, dry, and cold, having come on, the brain when it should have been expanded and purged, by the coryza and hoarseness is then constricted and contracted, so that the summer and the heat occurring suddenly, and a change supervening, these diseases fall out. And such cities as lie well to the sun and winds, and use good waters, feel these changes less, but such as use marshy and poorly waters, and lie well both as regards the winds and the sun, these all feel it more. And if the summer be dry, those diseases soon cease, but if rainy, they are protracted, and there is danger of any sore that there is becoming phagedenic from any cause, and henteries and dropsies supervene at the conclusion of diseases, for the bowels are not readily dried up. And if the summer be rainy and southerly, and next the autumn, the winter must, of necessity, be sickly, and ardent fevers are likely to attack those that are phlegmatic, and more elderly than forty years, and pleurisies and peripneumonies those that are bilious. But if the summer is parched and northerly, but the autumn rainy and southerly, headache and sphacelus of the brain are likely to occur, and in addition hoarseness, coryza, coughs, and in some cases, consumption. But if the season is northerly and without water, there being no rain, neither after the Dogstar nor Arcturus, this state agrees best with those who are naturally phlegmatic, with those who are of a humid temperament, and with women, but it is most inimical to the bilious, for they become much parched up, and ophthalmies of a dry nature supervene, fevers both acute and chronic,

and in some cases melancholy, for the most humid and watery part of the bile being consumed, the thickest and most acrid portion is left, and of the blood likewise, when these diseases come upon them. But all these are beneficial to the phlegmatic, for they are thereby dried up, and reach winter not oppressed with humors, but with them dried up.

11 Whoever studies and observes these things may be able to foresee most of the effects which will result from the changes of the seasons, and one ought to be particularly guarded during the greatest changes of the seasons, and neither willingly give medicines, nor apply the cautery to the belly, nor make incisions there until ten or more days be past. Now, the greatest and most dangerous are the two solstices, and especially the summer, and also the two equinoxes, but especially the autumnal. One ought also to be guarded about the rising of the stars, especially of the Dogstar, then of Arcturus, and then the setting of the Pleiades, for diseases are especially apt to prove critical in those days, and some prove fatal, some pass off, and all others change to another form and another constitution. So it is with regard to them.

12 I wish to show, respecting Asia and Europe, how, in all respects, they differ from one another, and concerning the figure of the inhabitants, for they are different, and do not at all resemble one another. To treat of all would be a long story, but I will tell you how I think it is with regard to the greatest and most marked differences. I say, then, that Asia differs very much from Europe as to the nature of all things, both with regard to the productions of the earth and the inhabitants, for everything is produced much more beautiful and large in Asia, the country is milder, and the dispositions of the inhabitants also are more gentle and affectionate. The cause of this is the temperature of the seasons, because it lies in the middle of the risings of the sun towards the east, and removed from the cold (and heat), for nothing tends to growth and mildness so much as when the climate has no predominant quality, but a general equality of temperature prevails. It is not everywhere the same with regard to Asia, but such parts of the country as lie intermediate between the heat and the cold, are the best supplied with

fruits and trees, and have the most genial climate, and enjoy the purest waters, both celestial and terrestrial For neither are they much burnt up by the heat, nor dried up by the drought and want of rain, nor do they suffer from the cold, since they are well watered from abundant showers and snow, and the fruits of the season, as might be supposed, grow in abundance, both such as are raised from seed that has been sown, and such plants as the earth produces of its own accord, the fruits of which the inhabitants make use of, training them from their wild state and transplanting them to a suitable soil, the cattle also which are reared there are vigorous, particularly prolific, and bring up young of the fairest description, the inhabitants too, are well fed, most beautiful in shape, of large stature, and differ little from one another either as to figure or size, and the country itself, both as regards its constitution and mildness of the seasons, may be said to bear a close resemblance to the spring Manly courage, endurance of suffering, laborious enterprise, and high spirit, could not be produced in such a state of things either among the native inhabitants or those of a different country, for there pleasure necessarily reigns For this reason, also, the forms of wild beasts there are much varied Thus it is, as I think, with the Egyptians and Libyans

13 But concerning those on the right hand of the summer risings of the sun as far as the Palus Mæotis (for this is the boundary of Europe and Asia), it is with them as follows. the inhabitants there differ far more from one another than those I have treated of above, owing to the differences of the seasons and the nature of the soil But with regard to the country itself, matters are the same there as among all other men, for where the seasons undergo the greatest and most rapid changes, there the country is the wildest and most unequal, and you will find the greatest variety of mountains, forests, plains, and meadows, but where the seasons do not change much there the country is the most even, and, if one will consider it, so is it also with regard to the inhabitants, for the nature of some is like to a country covered with trees and well watered, of some, to a thin soil deficient in water, of others, to fenny and marshy places, and of

some again, to a plain of bare and parched land. For the seasons which modify their natural frame of body are varied, and the greater the varieties of them the greater also will be the differences of their shapes.

14 I will pass over the smaller differences among the nations, but will now treat of such as are great either from nature, or custom, and, first, concerning the Macrocephali. There is no other race of men which have heads in the least resembling theirs. At first, usage was the principal cause of the length of their head, but now nature cooperates with usage. They think those the most noble who have the longest heads. It is thus with regard to the usage immediately after the child is born, and while its head is still tender, they fashion it with their hands, and constrain it to assume a lengthened shape by applying bandages and other suitable contrivances whereby the spherical form of the head is destroyed, and it is made to increase in length. Thus, at first, usage operated, so that this constitution was the result of force; but, in the course of time, it was formed naturally, so that usage had nothing to do with it, for the semen comes from all parts of the body, sound from the sound parts, and unhealthy from the unhealthy parts. If, then, children with bald heads are born to parents with bald heads, and children with blue eyes to parents who have blue eyes, and if the children of parents having distorted eyes squint also for the most part, and if the same may be said of other forms of the body, what is to prevent it from happening that a child with a long head should be produced by a parent having a long head? But now these things do not happen as they did formerly, for the custom no longer prevails owing to their intercourse with other men. Thus it appears to me to be with regard to them.

15 As to the inhabitants of Phasis, their country is fenny, warm, humid, and wooded, copious and severe rains occur there at all seasons, and the life of the inhabitants is spent among the fens, for their dwellings are constructed of wood and reeds, and are erected amidst the waters, they seldom practice walking either to the city or the market, but sail about, up and down, in canoes constructed out of single trees, for there are many canals

there They drink the hot and stagnant waters, both when rendered putrid by the sun, and when swollen with rains The Phasis itself is the most stagnant of all rivers, and runs the smoothest, all the fruits which spring there are unwholesome, of feeble and imperfect growth, owing to the redundance of water, and on this account they do not ripen, for much vapor from the waters overspreads the country For these reasons the Phasians have shapes different from those of all other men, for they are large in stature, and of a very gross habit of body, so that not a joint nor vein is visible, in color they are sallow, as if affected with jaundice Of all men they have the roughest voices, from their breathing an atmosphere which is not clear, but misty and humid, they are naturally rather languid in supporting bodily fatigue The seasons undergo but little change either as to heat or cold, their winds for the most part are southerly, with the exception of one peculiar to the country, which sometimes blows strong, is violent and hot, and is called by them the wind *cenchron* The north wind scarcely reaches them, and when it does blow it is weak and gentle Thus it is with regard to the different nature and shape of the inhabitants of Asia and Europe

16 And with regard to the pusillanimity and cowardice of the inhabitants, the principal reason why the Asiatics are more unwarlike and of more gentle disposition than the Europeans is, the nature of the seasons, which do not undergo any great changes either to heat or cold, or the like, for there is neither excitement of the understanding nor any strong change of the body by which the temper might be ruffled, and they be roused to inconsiderate emotion and passion, rather than living as they do always in the same state It is changes of all kinds which arouse the understanding of mankind, and do not allow them to get into a torpid condition For these reasons, it appears to me, the Asiatic race is feeble, and further, owing to their laws, for monarchy prevails in the greater part of Asia, and where men are not their own masters nor independent, but are the slaves of others, it is not a matter of consideration with them how they may acquire military discipline, but how they may seem not to be warlike, for the dangers are not equally shared, since they must serve as soldiers,

perhaps endure fatigue, and die for their masters, far from their children, their wives, and other friends, and whatever noble and manly actions they may perform lead only to the aggrandizement of their masters, whilst the fruits which they reap are dangers and death, and, in addition to all this, the lands of such persons must be laid waste by the enemy and want of culture. Thus, then, if any one be naturally warlike and courageous, his disposition will be changed by the institutions. As a strong proof of all this, such Greeks or barbarians in Asia as are not under a despotic form of government, but are independent, and enjoy the fruits of their own labors, are of all others the most warlike, for these encounter dangers on their own account, bear the prizes of their own valor, and in like manner endure the punishment of their own cowardice. And you will find the Asiatics differing from one another, for some are better and others more dastardly, of these differences, as I stated before, the changes of the seasons are the cause. Thus it is with Asia.

17 In Europe there is a Scythian race, called Sauromatæ, which inhabits the confines of the Palus Mæotis, and is different from all other races. Their women mount on horseback, use the bow, and throw the javelin from their horses, and fight with their enemies as long as they are virgins, and they do not lay aside their virginity until they kill three of their enemies, nor have any connection with men until they perform the sacrifices according to law. Whoever takes to herself a husband, gives up riding on horseback unless the necessity of a general expedition obliges her. They have no right breast, for while still of a tender age their mothers heat strongly a copper instrument constructed for this very purpose, and apply it to the right breast, which is burnt up, and its development being arrested, all the strength and fullness are determined to the right shoulder and arm.

18 As the other Scythians have a peculiarity of shape, and do not resemble any other, the same observation applies to the Egyptians, only that the latter are oppressed by heat and the former by cold. What is called the Scythian desert is a prairie, abound in meadows, high-lying, and well watered, for the rivers which carry off the water from the plains are large. There live

those Scythians which are called Nomades, because they have no houses, but live in wagons The smallest of these wagons have four wheels, but some have six, they are covered in with felt, and they are constructed in the manner of houses, some having but a single apartment, and some three, they are proof against rain, snow, and winds The wagons are drawn by yokes of oxen, some of two and others of three, and all without horns, for they have no horns, owing to the cold In these wagons the women live, but the men are carried about on horses, and the sheep, oxen, and horses accompany them, and they remain on any spot as long as there is provender for their cattle, and when that fails they migrate to some other place They eat boiled meat, and drink the milk of maies, and also eat *hippace*, which is cheese prepared from the milk of the mare Such is their mode of life and their customs

19 In respect of the seasons and figure of body, the Scythian race, like the Egyptian, have a uniformity of resemblance, different from all other nations, they are by no means prolific, and the wild beasts which are indigenous there are small in size and few in number, for the country lies under the Northern Bears, and the Rhiphæan mountains, whence the north wind blows, the sun comes very near to them only when in the summer solstice, and warms them but for a short period, and not strongly, and the winds blowing from the hot regions of the earth do not reach them, or but seldom, and with little force, but the winds from the north always blow, congealed, as they are, by the snow, the ice, and much water, for these never leave the mountains, which are thereby rendered uninhabitable A thick fog covers the plains during the day, and amidst it they live, so that winter may be said to be always present with them, or, if they have summer, it is only for a few days, and the heat is not very strong Their plains are high-lying and naked, not crowned with mountains, but extending upwards under the Northern Bears The wild beasts there are not large, but such as can be sheltered underground, for the cold of winter and the barrenness of the country prevent their growth, and because they have no covert nor shelter The changes of the seasons, too, are not great nor violent, for, in

fact, they change gradually, and therefore their figures resemble one another, as they all equally use the same food, and the same clothing summer and winter, respiring a humid and dense atmosphere, and drinking water from snow and ice, neither do they make any laborious exertions, for neither body nor mind is capable of enduring fatigue when the changes of the seasons are not great. For these reasons their shapes are gross and fleshy, with ill-marked joints, of a humid temperament, and deficient in tone the internal cavities, and especially those of the intestines, are full of humors, for the belly cannot possibly be dry in such a country, with such a constitution and in such a climate, but owing to their fat, and the absence of hairs from their bodies, their shapes resemble one another, the males being all alike, and so also with the women, for the seasons being of a uniform temperature, no corruption or deterioration takes place in the concretion of the semen, unless from some violent cause, or from disease.

20 I will give you a strong proof of the humidity (lavity?) of their constitutions. You will find the greater part of the Scythians, and all the Nomades, with marks of the cautery on their shoulders, arms, wrists, breasts, hip-joints, and loins, and that for no other reason but the humidity and flabbiness of their constitution, for they can neither strain with their bows, nor launch the javelin from their shoulder owing to their humidity and atony but when they are burnt, much of the humidity in their joints is dried up, and they become better braced, better fed, and their joints get into a more suitable condition. They are flabby and squat at first, because, as in Egypt, they are not swathed (?), and then they pay no attention to horsemanship, so that they may be adepts at it, and because of their sedentary mode of life, for the males, when they cannot be carried about on horseback, sit the most of their time in the wagon, and rarely practise walking, because of their frequent migrations and shiftings of situation, and as to the women, it is amazing how flabby and sluggish they are. The Scythian race are tawny from the cold, and not from the intense heat of the sun, for the whiteness of the skin is parched by the cold, and becomes tawny.

21 It is impossible that persons of such a constitution could be prolific, for, with the man, the sexual desires are not strong, owing to the laxity of his constitution, the softness and coldness of his belly, from all which causes it is little likely that a man should be given to venery, and besides, from being jaded by exercise on horseback, the men become weak in their desires. On the part of the men these are the causes, but on that of the women, they are embonpoint and humidity, for the womb cannot take in the semen, nor is the menstrual discharge such as it should be, but scanty and at too long intervals, and the mouth of the womb is shut up by fat and does not admit the semen, and, moreover, they themselves are indolent and fat, and their bellies cold and soft. From these causes the Sythian race is not prolific. Their female servants furnish a strong proof of this, for they no sooner have connection with a man than they prove with child, owing to their active course of life and the slenderness of body.

22 And, in addition to these, there are many eunuchs among the Scythians, who perform female work, and speak like women. Such persons are called effeminates. The inhabitants of the country attribute the cause of their impotence to a god, and venerate and worship such persons, every one dreading that the like might befall himself, but to me it appears that such affections are just as much divine as all others are, and that no one disease is either more divine or more human than another, but that all are alike divine, for that each has its own nature, and that no one arises without a natural cause. But I will explain how I think that the affection takes its rise. From continued exercise on horseback they are seized with chronic defluxions in their joints, owing to their legs always hanging down below their horses, they afterwards become lame and stiff at the hip-joint, such of them, at least, as are severely attacked with it. They treat themselves in this way: when the disease is commencing, they open the vein behind either ear, and when the blood flows, sleep, from feebleness, seizes them, and afterwards they awaken, some in good health and others not. To me it appears that the semen is altered by this treatment, for there are veins behind the ears which, if cut, induce impotence, now, these veins would appear

to me to be cut ⁹ Such persons afterwards, when they go in to women and cannot have connection with them, at first do not think much about it, but remain quiet, but when, after making the attempt two, three, or more times, they succeed no better, fancying they have committed some offence against the god whom they blame for the affection, they put on female attire, reproach themselves for effeminacy, play the part of women, and perform the same work as women do This the rich among the Scythians endure, not the basest, but the most noble and powerful, owing to their riding on horseback, for the poor are less affected, as they do not ride on horses And yet, if this disease had been more divine than the others, it ought not to have befallen the most noble and the richest of the Scythians alone, but all alike, or rather those who have little, as not being able to pay honors to the gods, if, indeed, they delight in being thus rewarded by men, and grant favors in return, for it is likely that the rich sacrifice more to the gods, and dedicate more votive offerings, inasmuch as they have wealth, and worship the gods, whereas the poor, from want, do less in this way, and, moreover, upbraid the gods for not giving them wealth, so that those who have few possessions were more likely to bear the punishments of these offences than the rich But, as I formerly said, these affections are divine just as much as others, for each springs from a natural cause, and this disease arises among the Scythians from such a cause as I have stated But it attacks other men in like manner, for whenever men ride much and very frequently on horseback, then many are affected with rheums in the joints, sciatica, and gout,

⁹ This opinion of our author was no doubt founded on the erroneous notion regarding the distribution of the veins which prevailed in his time, and which we find advocated in the tract "on the Nature of Man," and elsewhere (See Aristot., H N, III, 3) Coray strives hard, in his annotations on this passage, to make out that the fact may be as he stated by his ancient countryman, although the hypothesis by which he explained it be false It is singular, however, that, after the lapse of more than two thousand years, Phrenology should have come to the assistance of Hippocrates in this case I need scarcely remark that Gall and his followers hold that the cerebellum is the seat of the animal appetites, so that, if this be really the fact, a close sympathy between the back of the head and the genital organs may be very legitimately inferred At all events, this coincidence between ancient observation and modern hypothesis must be admitted to be very remarkable

and they are inept at venery But these complaints befall the Scythians, and they are the most impotent of men for the aforesaid causes, and because they always wear breeches, and spend the most of their time on horseback, so as not to touch their privy parts with the hands, and from the cold and fatigue they forget the sexual desire, and do not make the attempt until after they have lost their virility Thus it is with the race of the Scythians

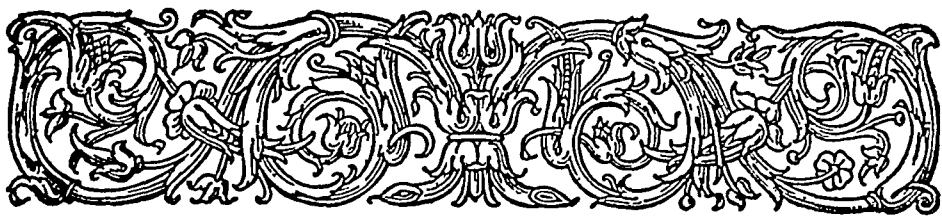
23 The other races in Europe differ from one another, both as to stature and shape, owing to the changes of the seasons, which are very great and frequent, and because the heat is strong, the winters severe, and there are frequent rains, and again protracted droughts, and winds, from which many and diversified changes are induced These changes are likely to have an effect upon generation in the coagulation of the semen, as this process cannot be the same in summer as in winter, nor in rainy as in dry weather, wherefore, I think, that the figures of Europeans differ more than those of Asiatics, and they differ very much from one another as to stature in the same city, for vitiations of the semen occur in its coagulation more frequently during frequent changes of the seasons, than where they are alike and equable And the same may be said of their dispositions, for the wild, and unsociable, and the passionate occur in such a constitution, for frequent excitement of the mind induces wildness, and extinguishes sociableness and mildness of disposition, and therefore I think the inhabitants of Europe more courageous than those of Asia, for a climate which is always the same induces indolence, but a changeable climate, laborious exertions both of body and mind, and from rest and indolence cowardice is engendered, and from laborious exertions and pains, courage On this account the inhabitants of Europe are more warlike than the Asiatics, and also owing to their institutions, because they are not governed by kings like the latter, for where men are governed by kings there they must be very cowardly, as I have stated before, for their souls are enslaved, and they will not willingly, or readily undergo dangers in order to promote the power of another, but those that are free undertake dangers on their own account,

and not for the sake of others, they court hazard and go out to meet it, for they themselves bear off the rewards of victory, and thus their institutions contribute not a little to their courage

Such is the general character of Europe and Asia

24 And there are in Europe other tribes, differing from one another in stature, shape, and courage the differences are those I formerly mentioned, and will now explain more clearly Such as inhabit a country which is mountainous, rugged, elevated, and well watered, and where the changes of the seasons are very great, are likely to have great variety of shapes among them, and to be naturally of an enterprising and warlike disposition, and such persons are apt to have no little of the savage and ferocious in their nature, but such as dwell in places which are low-lying, abounding in meadows and ill ventilated, and who have a larger proportion of hot than of cold winds, and who make use of warm waters—these are not likely to be of large stature nor well proportioned, but are of a broad make, fleshy, and have black hair, and they are rather of a dark than of a light complexion, and are less likely to be phlegmatic than bilious, courage and laborious enterprise are not naturally in them, but may be engendered in them by means of their institutions And if there be rivers in the country which carry off the stagnant and rain water from it, these may be wholesome and clear, but if there be no rivers, but the inhabitants drink the waters of fountains, and such as are stagnant and marshy, they must necessarily have prominent bellies and enlarged spleens But such as inhabit a high country, and one that is level, windy, and well-watered, will be large of stature, and like to one another, but their minds will be rather unmanly and gentle Those who live on thin, ill-watered, and bare soils, and not well attuned in the changes of the seasons, in such a country they are likely to be in their persons rather hard and well braced, rather of a blond than a dark complexion, and in disposition and passions haughty and self-willed For, where the changes of the seasons are most frequent, and where they differ most from one another, there you will find their forms, dispositions, and nature the most varied These are the strongest of the natural causes of difference, and next the country in which

one lives, and the waters, for, in general, you will find the forms and dispositions of mankind to correspond with the nature of the country, for where the land is fertile, soft, and well-watered, and supplied with waters from very elevated situations, so as to be hot in summer and cold in winter, and where the seasons are fine, there the men are fleshy, have ill-formed joints, and are of a humid temperament, they are not disposed to endure labor, and, for the most part, are base in spirit, indolence and sluggishness are visible in them, and to the arts they are dull, and not clever nor acute. When the country is bare, not fenced, and rugged, blasted by the winter and scorched by the sun, there you may see the men hardy, slender, with well-shaped joints, well-braced, and shaggy, sharp industry and vigilance accompany such a constitution, in morals and passions they are haughty and opinionative, inclining rather to the fierce than to the mild, and you will find them acute and ingenious as regards the arts, and excelling in military affairs, and likewise all the other productions of the earth corresponding to the earth itself. Thus it is with regard to the most opposite natures and shapes, drawing conclusions from them, you may judge of the rest without any risk of error.



The Book of Prognostics

IT APPEARS to me a most excellent thing for the physician to cultivate Prognosis, for by foreseeing and foretelling, in the presence of the sick, the present, the past, and the future, and explaining the omissions which patients have been guilty of,¹ he will be the more readily believed to be acquainted with the circumstances of the sick, so that men will have confidence to intrust themselves to such a physician. And he will manage the cure best who has foreseen what is to happen from the present state of matters. For it is impossible to make all the sick well, this, indeed, would have been better than to be able to foretell what is going to happen, but since men die, some even before calling the physician, from the violence of the disease, and some die immediately after calling him, having lived, perhaps, only one day or a little longer, and before the physician could bring his art to counteract the disease, it therefore becomes necessary to know the nature of such affections, how far they are above the powers of the constitution, and, moreover, if there be anything divine in the diseases, and to learn a foreknowledge of this also. Thus a man will be the more esteemed to be a good physician, for he will be the better able to treat those aright who can be saved, from having long

¹ Galen, in his Commentary on this clause of the sentence, acutely remarks that patients are justly disposed to form a high opinion of a physician who points out to them symptoms of their complaint which they themselves had omitted to mention to him. And Staphanus further remarks that the patient naturally estimates highly the acumen of the physician who detects any errors in regimen which he has been guilty of, such as drinking water, or eating fruit when forbidden, (Ed Dietz, p 54,) or when he has some disease about him, such as bubo or inflammation, which he wishes to conceal (Ibid, p 63)

anticipated everything, and by seeing and announcing beforehand those who will live and those who will die, he will thus escape censure

2 He should observe thus in acute diseases first, the countenance of the patient, if it be like those of persons in health, and more so, if like itself, for this is the best of all, whereas the most opposite to it is the worst, such as the following, *a sharp nose, hollow eyes, collapsed temples, the ears cold, contracted, and their lobes turned out the skin about the forehead being rough, distended, and parched, the color of the whole face being green, black, livid, or lead-colored* If the countenance be such at the commencement of the disease, and if this cannot be accounted for from the other symptoms, inquiry must be made whether the patient has long wanted sleep, whether his bowels have been very loose, and whether he has suffered from want of food, and if any of these causes be confessed to, the danger is to be reckoned so far less, and it becomes obvious, in the course of a day and a night, whether or not the appearance of the countenance proceeded from these causes But if none of these be said to exist, and if the symptoms do not subside in the aforesaid time, it is to be known for certain that death is at hand And, also, if the disease be in a more advanced stage either on the third or fourth day, and the countenance be such, the same inquiries as formerly directed are to be made, and the other symptoms are to be noted, those in the whole countenance, those on the body, and those in the eyes, for if they shun the light, or weep involuntarily, or squint, or if the one be less than the other, or if the white of them be red, livid, or has black veins in it, if there be a gum upon the eyes, if they are restless, protruding, or are become very hollow, and if the countenance be squalid and dark, or the color of the whole face be changed—all these are to be reckoned bad and fatal symptoms The physician should also observe the appearance of the eyes from below the eyelids in sleep, for when a portion of the white appears, owing to the eyelids not being closed together, and when this is not connected with diarrhœa or purgation from medicine, or when the patient does not sleep

thus from habit, it is to be reckoned an unfavorable and very deadly symptom, but if the eyelid be contracted, livid, or pale, or also the lip, or nose, along with some of the other symptoms, one may know for certain that death is close at hand. It is a mortal symptom, also, when the lips are relaxed, pendent, cold, and blanched.

3 It is well when the patient is found by his physician reclining upon either his right or his left side, having his hands, neck, and legs slightly bent, and the whole body lying in a relaxed state, for thus the most of persons in health recline, and these are the best of postures which most resemble those of healthy persons. But to lie upon one's back, with the hands, neck, and the legs extended, is far less favorable. And if the patient incline forward, and sink down to the foot of the bed, it is a still more dangerous symptom, but if he be found with his feet naked and not sufficiently warm, and the hands, neck, and legs tossed about in a disorderly manner and naked, it is bad, for it indicates aberration of intellect. It is a deadly symptom, also, when the patient sleeps constantly with his mouth open, having his legs strongly bent and plaited together, while he lies upon his back, and to lie upon one's belly, when not habitual to the patient to sleep thus while in good health, indicates delirium, or pain in the abdominal regions. And for the patient to wish to sit erect at the acme of a disease is a bad symptom in all acute diseases, but particularly so in pneumonia. To grind the teeth in fevers, when such has not been the custom of the patient from childhood, indicates madness and death, both which dangers are to be announced beforehand as likely to happen, and if a person in delirium do this it is a very deadly symptom. And if the patient had an ulcer previously, or if one has occurred in the course of the disease, it is to be observed, for if the man be about to die the sore will become livid and dry, or yellow and dry before death.

4 Respecting the movement of the hands I have these observations to make. When in acute fevers, pneumonia, phrenitis, or headache, the hands are waved before the face, hunting

through empty space, as if gathering bits of straw, picking the nap from the coverlet, or tearing chaff from the wall—all such symptoms are bad and deadly

5 Respiration, when frequent, indicates pain or inflammation in the parts above the diaphragm a large respiration performed at a great interval announces delirium, but a cold respiration at nose or mouth is a very fatal symptom Free respiration is to be looked upon as contributing much to the safety of the patient in all acute diseases, such as fevers, and those complaints which come to a crisis in forty days

6 Those sweats are the best in all acute diseases which occur on the critical days, and completely carry off the fever Those are favorable, too, which taking place over the whole body, show that the man is bearing the disease better But those that do not produce this effect are not beneficial The worst are cold sweats, confined to the head, face, and neck, these in an acute fever prognosticate death, or in a milder one, a prolongation of the disease, and sweats which occur over the whole body, with the characters of those confined to the neck, are in like manner bad Sweats attended with a miliary eruption, and taking place about the neck, are bad, sweats in the form of drops and of vapour are good One ought to know the entire character of sweats, for some are connected with prostration of strength in the body, and some with intensity of the inflammation

7 That state of the hypochondrium is best when it is free from pain, soft, and of equal size on the right side and the left But if inflamed, or painful, or distended, or when the right and left sides are of disproportionate sizes,—all these appearances are to be dreaded And if there be also pulsation in the hypochondrium, it indicates perturbation or delirium, and the physician should examine the eyes of such persons, for if their pupils be in rapid motion, such persons may be expected to go mad A swelling in the hypochondrium, that is hard and painful, is very bad, provided it occupy the whole hypochondrium, but if it be on either side, it is less dangerous when on the left Such swellings at the commencement of the disease prognosticate speedy death, but if the fever has passed twenty days, and the

swelling has not subsided, it turns to a suppuration². A discharge of blood from the nose occurs to such in the first period, and proves very useful, but inquiry should be made if they have headache or indistinct vision, for if there be such, the disease will be determined thither. The discharge of blood is rather to be expected in those who are younger than thirty-five years. Such swellings as are soft, free from pain, and yield to the finger, occasion more protracted crises, and are less dangerous than the others. But if the fever continue beyond sixty days, without any subsidence of the swelling, it indicates that empyema is about to take place, and a swelling in any other part of the cavity will terminate in like manner. Such, then, as are painful, hard, and large, indicate danger of speedy death, but such as are soft, free of pain, and yield when pressed with the finger, are more chronic than these. Swellings in the belly less frequently form abscesses than those in the hypochondrium, and seldome of all, those below the navel are converted into suppuration, but you may rather expect a hemorrhage from the upper parts. But the suppuration of all protracted swellings about these parts is to be anticipated. The collections of matter there are to be thus judged of. such as are determined outwards are the best when they are small, when they protrude very much, and swell to a point, such as are large and broad, and which do not swell out to a sharp point, are the worst. Of such as break internally, the best are those which have no external communication, but are covered and indolent, and when the whole place is free from discoloration. That pus is best which is white, homogeneous, smooth, and not at all fetid, the contrary to this is the worst.

8 All dropsies arising from acute diseases are bad, for they do not remove the fever, and are very painful and fatal. The most of them commence from the flanks and loins, but some from the liver, in those which derive their origin from the flanks and loins the feet swell, protracted diarrhœas supervene, which neither

² The author evidently alluded to hepatitis ending in abscess. This would seem to have been a very common termination of inflammation of the liver in Greece, as it is often described in the ancient medical works. See PAULUS ÆGINETA, B III, 46, and the authorities quoted there in the Sydenham Society's edition.

remove the pains in the flanks and loins, nor soften the belly, but in dropsies which are connected with the liver there is a tickling cough, with scarcely any perceptible expectoration, and the feet swell, there are no evacuations from the bowels, unless such as are hard and forced, and there are swellings about the belly, sometimes on the one side and sometimes on the other, and these increase and diminish by turns

9 It is a bad symptom when the head, hands, and feet are cold, while the belly and sides are hot, but it is a very good symptom when the whole body is equally hot The patient ought to be able to turn round easily, and to be agile when raised up, but if he appear heavy in the rest of his body as well as in his hands and feet, it is more dangerous, and if, in addition to the weight, his nails and fingers become livid, immediate death may be anticipated, and if the hands and feet be black it is less dangerous than if they be livid, but the other symptoms must be attended to, for if he appear to bear the illness well, and if certain of the salutary symptoms appear along with these there may be hope that the disease will turn to a deposition, so that the man may recover, but the blackened parts of the body will drop off When the testicles and members are retracted upwards, they indicate strong pains and danger of death

10 With regard to sleep—as is usual with us in health, the patient should wake during the day and sleep during the night If this rule be anywise altered it is so far worse but there will be little harm provided he sleep in the morning for the third part of the day, such sleep as takes place after this time is more unfavorable, but the worst of all is to get no sleep either night or day, for it follows from this symptom that the insomnolency is connected with sorrow and pains, or that he is about to become delirious

11 The excrement is best which is soft and consistent, is passed at the hour which was customary to the patient when in health, in quantity proportionate to the ingesta, for when the passages are such, the lower belly is in a healthy state But if the discharges be fluid, it is favorable that they are not accompanied with a noise, nor are frequent, nor in great quantity, for

the man being oppressed by frequently getting up, must be deprived of sleep, and if the evacuations be both frequent and large, there is danger of his falling into *deliquium animi*. But in proportion to the *ingesta* he should have evacuations twice or thrice in the day, once at night and more copiously in the morning, as is customary with a person in health. The *fæces* should become thicker when the disease is tending to a crisis, they ought to be yellowish and not very fetid. It is favorable that round worms be passed with the discharges when the disease is tending to a crisis. The belly, too, through the whole disease, should be soft and moderately distended, but excrements that are very watery, or white, or green, or very red, or frothy, are all bad. It is also bad when the discharge is small, and viscid, and white, and greenish, and smooth, but still more deadly appearances are the black, or fatty, or livid, or verdigris-green, or fetid. Such as are of varied characters indicate greater duration of the complaint, but are no less dangerous, such as those which resemble scrapings, those which are bilious, those resembling leeks, and the black, these being sometimes passed together, and sometimes singly. It is best when wind passes without noise, but it is better that flatulence should pass even thus than that it should be retained, and when it does pass thus, it indicates either that the man is in pain or in delirium, unless he gives vent to the wind spontaneously. Pains in the *hypochondria*, and swellings, if recent, and not accompanied with inflammation, are relieved by *borborygmi* supervening in the *hypochondrium*, more especially if it pass off with *fæces*, urine, and wind, but even although not, it will do good by passing along, and it also does good by descending to the lower part of the belly.

12 The urine is best when the sediment is white, smooth, and consistent during the whole time, until the disease come to a crisis, for it indicates freedom from danger, and an illness of short duration, but if deficient, and if it be sometimes passed clear, and sometimes with a white and smooth sediment, the disease will be more protracted, and not so void of danger. But if the urine be reddish, and the sediment consistent and smooth, the affection, in this case, will be more protracted than the former,

but still not fatal But farinaceous sediments in the urine are bad, and still worse are the leafy, the white and thin are very bad, but the furfuraceous are still worse than these Clouds carried about in the urine are good when white, but bad if black When the urine is yellow and thin, it indicates that the disease is unconcocted, and if it (the disease) should be protracted, there may be danger lest the patient should not hold out until the urine be concocted But the most deadly of all kinds of urine are the fetid, watery, black, and thick, in adult men and women the black is of all kinds of urine the worst, but in children, the watery In those who pass thin and crude urine for a length of time, if they have otherwise symptoms of convalescence, an abscess may be expected to form in the parts below the diaphragm And fatty substances floating on the surface are to be dreaded, for they are indications of melting And one should consider respecting the kinds of urine, which have clouds, whether they tend upwards or downwards, and the colors which they have and such as fall downwards, with the colors as described, are to be reckoned good and commended, but such as are carried upwards, with the colors as described, are to be held as bad, and are to be distrusted But you must not allow yourself to be deceived if such urine be passed while the bladder is diseased, for then it is a symptom of the state, not of the general system, but of a particular viscus

13 That vomiting is of most service which consists of phlegm and bile mixed together, and neither very thick nor in great quantity, but those vomitings which are more unmixed are worse But if that which is vomited be of the color of leeks or livid, or black, whatever of these colors it be, it is to be reckoned bad, but if the same man vomit all these colors, it is to be reckoned a very fatal symptom But of all the vomitings, the livid indicates the most imminent danger of death, provided it be of a fetid smell But all the smells which are somewhat putrid and fetid, are bad in all vomitings

14 The expectoration in all pains about the lungs and sides, should be quickly and easily brought up, and a certain degree of yellowness should appear strongly mixed up with the sputum

But if brought up long after the commencement of the pain, and of a yellow or ruddy color, or if it occasions much cough, or be not strongly mixed, it is worse, for that which is intensely yellow is dangerous, but the white, and viscid, and round, do no good. But that which is very green and frothy is bad, but if so intense as to appear black, it is still more dangerous than these, it is bad if nothing is expectorated, and the lungs discharge nothing, but are gorged with matters which boil (as it were) in the air-passages. It is bad when coryza and sneezing either precede or follow affections of the lungs, but in all other affections, even the most deadly, sneezing is a salutary symptom. A yellow spittle mixed up with not much blood in cases of pneumonia, is salutary and very beneficial if spit up at the commencement of the disease, but if on the seventh day, or still later, it is less favorable. And all sputa are bad which do not remove the pain. But the worst is the black, as has been described. Of all others the sputa which remove the pain are the best.

15. When the pains in these regions do not cease, either with the discharge of the sputa, nor with alvine evacuations, nor from venesection, purging with medicine, nor a suitable regimen, it is to be held that they will terminate in suppurations. Of empyemata such as are spit up while the sputum is still bilious, are very fatal, whether the bilious portion be expectorated separate, or along with the other, but more especially if the empyema begin to advance after this sputum on the seventh day of the disease. It is to be expected that a person with such an expectoration shall die on the fourteenth day, unless something favorable supervene. The following are favorable symptoms to support the disease easily, to have free respiration, to be free from pain, to have the sputa readily brought up, the whole body to appear equally warm and soft, to have no thirst, the urine, and fæces, sleep, and sweats to be all favorable, as described before, when all these symptoms concur, the patient certainly will not die, but if some of these be present and some not, he will not survive longer than the fourteenth day. The bad symptoms are the opposite of these, namely, to bear the disease with difficulty, respiration large and dense, the pain not ceasing, the sputum

scarcely coughed up, strong thirst, to have the body unequally affected by the febrile heat, the belly and sides intensely hot, the forehead, hands, and feet cold, the urine, and excrements, the sleep, and sweats, all bad, agreeably to the characters described above, if such a combination of symptoms accompany the expectoration, the man will certainly die before the fourteenth day, and either on the ninth or eleventh. Thus then one may conclude regarding this expectoration, that it is very deadly, and that the patient will not survive until the fourteenth day. It is by balancing the concomitant symptoms whether good or bad, that one is to form a prognosis, for thus it will most probably prove to be a true one. Most other suppurations burst, some on the twentieth, some on the thirtieth, some on the fortieth, and some as late as the sixtieth day³

16 One should estimate when the commencement of the suppuration will take place, by calculating from the day on which the patient was first seized with fever, or if he had a rigor, and if he says, that there is a weight in the place where he had pain formerly, for these symptoms occur in the commencement of suppurations. One then may expect the rupture of the abscesses to take place from these times according to the periods formerly stated. But if the empyema be only on either side, one should turn him and inquire if he has pain on the other side, and if the one side be hotter than the other, and when laid upon the sound side, one should inquire if he has the feeling of a weight hanging from above, for if so, the empyema will be upon the opposite side to that on which the weight was felt.

17 Empyema may be recognized in all cases by the following symptoms. In the first place, the fever does not go off, but is

³ The observations of Andral have in some measure confirmed the opinion of Hippocrates and other authors, ancient and modern, that there are certain days in the duration of the disease in which there is a greater tendency to amelioration. Of ninety-three cases, he found twenty-three give way on the seventh, thirteen on the eleventh, eleven on the fourteenth, and nine on the twentieth days. The recoveries in the remaining cases commenced on twelve out of forty-two non-critical days, as many as eleven being ascribed to the tenth day. Thus the recoveries on critical days averaged as high as fourteen, while those on non-critical scarcely exceeded three" (Dr C J B Williams on Pneumonia, Cyclop of Pract Med, vol III, p 405) See also Andral, Clin Med, c 11, p 365

slight during the day, and increases at night, and copious sweats supervene, there is a desire to cough, and the patients expectorate nothing worth mentioning, the eyes become hollow, the cheeks have red spots on them, the nails of the hands are bent, the fingers are hot especially their extremities, there are swellings in the feet, they have no desire of food, and small blisters (*phlyctænæ*) occur over the body. These symptoms attend chronic *empyemata*, and may be much trusted to, and such as are of short standing are indicated by the same, provided they be accompanied by those signs which occur at the commencement, and if at the same time the patient has some difficulty of breathing. Whether they will break earlier or later may be determined by these symptoms, if there be pain at the commencement, and if the *dyspnœa*, cough, and *ptyalism* be severe, the rupture may be expected in the course of twenty days or still earlier, but if the pain be more mild, and all the other symptoms in proportion, you may expect from these the rupture to be later, but pain, *dyspnœa*, and *ptyalism*, must take place before the rupture of the abscess. Those patients recover most readily whom the fever leaves the same day that the abscess bursts,—when they recover their appetite speedily, and are freed from the thirst,—when the alvine discharges are small and consistent, the matter white, smooth, uniform in color, and free of phlegm, and if brought up without pain or strong coughing. Those die whom the fever does not leave, or when appearing to leave them it returns with an exacerbation; when they have thirst, but no desire of food, and there are watery discharges from the bowels, when the expectoration is green or livid, or pituitous and frothy, if all these occur they die, but if certain of these symptoms supervene, and others not, some patients die and some recover, after a long interval. But from all the symptoms taken together one should form a judgment, and so in all other cases.

18 When abscesses form about the ears, after peripneumonic affections, or depositions of matter take place in the inferior extremities and end in fistula, such persons recover. The following observations are to be made upon them if the fever persist, and the pain do not cease, if the expectoration be not

normal, and if the alvine discharges be neither bilious, nor free and unmixed, and if the urine be neither copious nor have its proper sediment, but if, on the other hand, all the other salutary symptoms be present, in such cases abscesses may be expected to take place. They form in the inferior parts when there is a collection of phlegm about the hypochondria, and in the upper when the hypochondria continue soft and free of pain, and when dyspnœa having been present for a certain time, ceases without any obvious cause. All deposits which take place in the legs after severe and dangerous attacks of pneumonia, are salutary, but the best are those which occur at the time when the sputa undergo a change, for if the swelling and pain take place while the sputa are changing from yellow and becoming of a purulent character, and are expectorated freely, under these circumstances the man will recover most favorably and the abscess becoming free of pain, will soon cease, but if the expectoration is not free, and the urine does not appear to have the proper sediment, there is danger lest the limb should be maimed, or that the case otherwise should give trouble. But if the abscesses disappear and go back, while expectoration does not take place, and fever prevails, it is a bad symptom, for there is danger that the man may get into a state of delirium and die. Of persons having empyema after peripneumonic affections, those that are advanced in life run the greatest risk of dying, but in the other kinds of empyema younger persons rather die. In cases of empyema treated by the cautery or incision, when the matter is pure, white, and not fetid, the patient recovers, but if of a bloody and dirty character, he dies.

19 Pains accompanied with fever which occur about the loins and lower parts, if they attack the diaphragm, and leave the parts below, are very fatal. Wherefore one ought to pay attention to the other symptoms, since if any unfavorable one supervene, the case is hopeless, but if while the disease is determined to the diaphragm, the other symptoms are not bad, there is great reason to expect that it will end in empyema. When the bladder is hard and painful, it is an extremely bad and mortal symptom, more especially in cases attended with continued

fever, for the pains proceeding from the bladder alone are enough to kill the patient, and at such a time the bowels are not moved, or the discharges are hard and forced. But urine of a purulent character, and having a white and smooth sediment, relieves the patient. But if no amendment takes place in the characters of the urine, nor the bladder become soft, and the fever is of the continual type, it may be expected that the patient will die in the first stages of the complaint. This form attacks children more especially, from their seventh to their fifteenth year.

20 Fevers come to a crisis on the same days as to number on which men recover and die. For the mildest class of fevers, and those originating with the most favorable symptoms, cease on the fourth day or earlier, and the most malignant, and those setting in with the most dangerous symptoms, prove fatal on the fourth day or earlier. The first class of them as to violence ends thus: the second is protracted to the seventh day, the third to the eleventh, the fourth to the fourteenth, the fifth to the seventeenth, and the sixth to the twentieth. Thus these periods from the most acute disease ascend by fours up to twenty. But none of these can be truly calculated by whole days, for neither the year nor the months can be numbered by entire days. After these in the same manner, according to the same progression, the first period is of thirty-four days, the second of forty days, and the third of sixty days. In the commencement of these it is very difficult to determine those which will come to a crisis after a long interval, for these beginnings are very similar, but one should pay attention from the first day, and observe further at every additional tetrad, and then one cannot miss seeing how the disease will terminate. The constitution of quartans is agreeable to the same order. Those which will come to a crisis in the shortest space of time, are the easiest to be judged of, for the differences of them are greatest from the commencement, thus those who are going to recover breathe freely, and do not suffer pain, they sleep during the night, and have the other salutary symptoms, whereas those that are to die have difficult respiration, are delirious, troubled with insomnolency, and have other bad symptoms. Matters being thus, one may conjecture, according

to the time, and each additional period of the diseases, as they proceed to a crisis. And in women, after parturition, the crises proceed agreeably to the same ratio.

21 Strong and continued headaches with fever, if any of the deadly symptoms be joined to them, are very fatal. But if without such symptoms the pain be prolonged beyond twenty days, a discharge of blood from the nose or some abscess in the inferior parts may be anticipated, but while the pain is recent, we may expect in like manner a discharge of blood from the nose, or a suppuration, especially if the pain be seated above the temples and forehead, but the hemorrhage is rather to be looked for in persons younger than thirty years, and the suppuration in more elderly persons.

22 Acute pain of the ear, with continual and strong fever, is to be dreaded, for there is danger that the man may become delirious and die. Since, then, this is a hazardous spot, one ought to pay particular attention to all these symptoms from the commencement. Younger persons die of this disease on the seventh day, or still earlier, but old persons much later, for the fevers and delirium less frequently supervene upon them, and on that account the ears previously come to a suppuration, but at these periods of life, relapses of the disease coming on generally prove fatal. Younger persons die before the ear suppurates, only if white matter run from the ear, there may be hope that a younger person will recover, provided any other favorable symptom be combined.

23 Ulceration of the throat with fever, is a serious affection, and if any other of the symptoms formerly described as being bad, be present, the physician ought to announce that his patient is in danger. Those quinsies are most dangerous, and most quickly prove fatal, which make no appearance in the fauces, nor in the neck, but occasion very great pain and difficulty of breathing, these induce suffocation on the first day, or on the second, the third, or the fourth. Such as, in like manner, are attended with pain, are swelled up, and have redness (erythema) in the throat, are indeed very fatal, but more protracted than

the former, provided the redness be great Those cases in which both the throat and the neck are red, are more protracted, and certain persons recover from them, especially if the neck and breast be affected with erythema, and the erysipelas be not determined inwardly If neither the erysipelas disappear on the critical day, nor any abscess form outwardly, nor any pus be spit up, and if the patient fancy himself well, and be free from pain, death, or a relapse of the erythema is to be apprehended It is much less hazardous when the swelling and redness are determined outwardly, but if determined to the lungs, they superinduce delirium, and frequently some of these cases terminate in empyema It is very dangerous to cut off or scarify enlarged uvulæ while they are red and large, for inflammations and hemorrhages supervene, but one should try to reduce such swellings by some other means at this season When the whole of it is converted into an abscess, which is called Uva, or when the extremity of the variety called Columella is larger and round, but the upper part thinner, at this time it will be safe to operate But it will be better to open the bowels gently before proceeding to the operation, if time will permit, and the patient be not in danger of being suffocated

24 When the fevers cease without any symptoms of resolution occurring, and not on the critical days, in such cases a relapse may be anticipated When any of the fevers is protracted, although the man exhibits symptoms of recovery, and there is no longer pain from any inflammation, nor from any other visible cause, in such a case a deposit, with swelling and pain, may be expected in some one of the joints, and not improbably in those below Such deposits occur more readily and in less time to persons under thirty years of age, and one should immediately suspect the formation of such a deposit, if the fever be protracted beyond twenty days, but to aged persons these less seldom happen, and not until the fever be much longer protracted Such a deposit may be expected, when the fever is of a continual type, and that it will pass into a quartan, if it become intermittent, and its paroxysms come on in an irregular manner, and if in

this form it approach autumn As deposits form most readily in persons below thirty years of age, so quartans most commonly occur to persons beyond that age It is proper to know that deposits occur most readily in winter, that then they are most protracted, but are less given to return Whoever, in a fever that is not of a fatal character, says that he has pain in his head, and that something dark appears to be before his eyes, and that he has pain at the stomach, will be seized with vomiting of bile, but if rigor also attack him, and the inferior parts of the hypochondrium are cold, vomiting is still nearer at hand, and if he eat or drink anything at such a season, it will be quickly vomited In these cases, when the pain commences on the first day, they are particularly oppressed on the fourth and the fifth, and they are relieved on the seventh, but the greater part of them begin to have pain on the third day, and are most especially tossed on the fifth, but are relieved on the ninth or eleventh, but in those who begin to have pains on the fifth day, and other matters proceed properly with them, the disease comes to a crisis on the fourteenth day But when in such a fever persons affected with headache, instead of having a dark appearance before their eyes, have dimness of vision, or flashes of light appear before their eyes, and instead of pain at the pit of the stomach, they have in their hypochondrium a fullness stretching either to the right or left side, without either pain or inflammation, a hemorrhage from the nose is to be expected in such a case, rather than a vomiting But it is in young persons particularly that the hemorrhage is to be expected, for in persons beyond the age of thirty-five, vomitings are rather to be anticipated Convulsions occur to children if acute fever be present, and the belly be constipated, if they cannot sleep, are agitated, and moan, and change color, and become green, livid, or ruddy These complaints occur most readily to children which are very young up to their seventh year, older children and adults are not equally liable to be seized with convulsions in fevers, unless some of the strongest and worst symptoms precede, such as those which occur in frenzy One must judge of children as of others, which will die and which recover, from the whole of the symptoms, as they have been

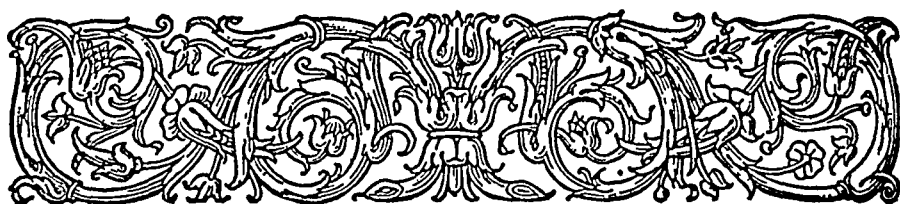
specially described ⁴ These things I say respecting acute diseases, and the affections which spring from them

25 He who would know correctly beforehand those that will recover, and those that will die, and in what cases the disease will be protracted for many days, and in what cases for a shorter time, must be able to form a judgment from having made himself acquainted with all the symptoms, and estimating their powers in comparison with one another, as has been described, with regard to the others, and the urine and sputa, as when the patient coughs up pus and bile together One ought also to consider promptly the influx of epidemical diseases and the constitution of the season One should likewise be well acquainted with the particular signs and the other symptoms, and not be ignorant how that, in every year, and at every season, bad symptoms prognosticate ill, and favorable symptoms good, since the afore-said symptoms appear to have held true in Libya, in Delos, and in Scythia,⁵ from which it may be known that, in the same regions, there is no difficulty in attaining a knowledge of many more things than these, if having learned them, one knows also how to judge and reason correctly of them But you should not complain because the name of any disease may happen not to be described here, for you may know all such as come to a crisis in the afore-mentioned times, by the same symptoms ⁶

⁴Our author here and elsewhere impresses it upon his readers that it is from the *tout ensemble* of the symptoms that a judgment is to be formed in every case This is evidently a remark of the most vital importance in forming a prognosis

⁵It has excited a great deal of discussion and difference of opinion to determine what our author means by specifying these three places, but the explanation given by Galen in his Commentary seems to me quite satisfactory According to him, the meaning of our author is that good and bad symptoms tell the same in all places, in the hot regions of Libya, the cold of Scythia, and the temperate of Delos It is further to be borne in mind that Odessus in Scythia, and Cyrene in Libya, were the extremities of the Grecian world, whilst Delos may be regarded as its centre It is proper to remark, however, that by the three places mentioned, Erotian understands the three quarters of the earth—Africa, Asia, and Europe

⁶The meaning of this last sentence has been supposed to be somewhat ambiguous, but to me it appears evidently to be this, that the rules of prognosis, as laid down above, apply to all diseases of an acute character, whether their names happen to be mentioned in the course of this work or not, so that it should not be considered a defect in the work that any one is omitted



On Regimen in Acute Diseases

THOSE who composed what are called "The Cnidian Sentences"¹ have described accurately what symptoms the sick experience in every disease, and how certain of them terminate, and in so far a man, even who is not a physician, might describe them correctly, provided he put the proper inquiries to the sick themselves what their complaints are. But those symptoms which the physician ought to know beforehand without being informed of them by the patient, are, for the most part, omitted, some in one case and some in others, and certain symptoms of vital importance for a conjectural judgment.² But when, in addition to the diagnosis, they describe how each complaint should be treated, in these cases I entertain a still greater difference of opinion with them respecting the rules they have laid down, and not only do I not agree with them on this account, but also because the remedies they use are few in number, for, with the exception of acute diseases, the only medi-

¹ The Cnidian Sentences in all probability were the results of the observations and theories made in the Temple of Health at Cnidos. We may reasonably conclude from what we know of them, that, like the Coacæ Prænotiones at Cos, the Cnidian Sentences at Cnidos were looked up to in the time of Hippocrates as the great guides to medical practice. How much, then, it is to be regretted that they have not come down to us like the other! It is clear, however, from Galen's Commentary, that the work was extant in his time, and from it, as will be seen, we are enabled to draw a few particulars respecting the theoretical and practical views of the Cnidians. Le Clerc considers it likely that Euryphon was the author of the Cnidian Sentences (*Hist. Phys.*, i, 3, 30), but it is evident, from the terms in which Hippocrates refers to them, that they were not the work of a single author. He makes mention, it will be remarked, of more than one person being concerned in remodelling them.

² By this our author means that the Cnidians neglected Prorrhetics and Prognostics. This must be obvious to every person who had entered properly into the spirit of the Hippocratic system of medicine.

cines which they give are drastic purgatives, with whey, and milk at certain times. If, indeed, these remedies had been good and suitable to the complaints in which they are recommended, they would have been still more deserving of recommendation, if, while few in number, they were sufficient, but this is by no means the case. Those, indeed, who have remodeled these "Sentences" have treated of the remedies applicable in each complaint more in a medical fashion. But neither have the ancients written anything worth mentioning respecting regimen, although this be a great omission. Some of them, indeed, were not ignorant of the many varieties of each complaint, and their manifold divisions, but when they wish to tell clearly the numbers (species?) of each disease they do not write correctly, for their species would be almost innumerable if every symptom experienced by the patients were held to constitute a disease, and receive a different name.

2 For my part, I approve of paying attention to everything relating to the art, and that those things which can be done well or properly should all be done properly, such as can be quickly done should be done quickly, such as can be neatly done should be done neatly, such operations as can be performed without pain should be done with the least possible pain, and that all other things of the like kind should be done better than they could be managed by the attendants. But I would more especially commend the physician who, in acute diseases, by which the bulk of mankind are cut off, conducts the treatment better than others. Acute diseases are those which the ancients named pleurisy, pneumonia, phrenitis, lethargy, causus, and the other diseases allied to these, including the continual fevers. For, unless when some general form of pestilential disease is epidemic, and diseases are sporadic and [not] of a similar character, there are more deaths from these diseases than from all the others taken together. The vulgar, indeed, do not recognize the difference between such physicians and their common attendants, and are rather disposed to commend and censure extraordinary remedies. This, then, is a great proof that the common people are most incompetent, of themselves, to form a judgment how such diseases should be treated since persons who are not physicians pass for physicians

owing most especially to these diseases, for it is an easy matter to learn the names of those things which are applicable to persons laboring under such complaints. For, if one names the juice of ptisan, and such and such a wine, and hydromel, the vulgar fancy that he prescribes exactly the same things as the physicians do, both the good and the bad, but in these matters there is a great difference between them.

3 But it appears to me that those things are more especially deserving of being consigned to writing which are undetermined by physicians, notwithstanding that they are of vital importance, and either do much good or much harm. By undetermined I mean such as these, wherefore certain physicians, during their whole lives, are constantly administering unstrained ptisans, and fancy they thus accomplish the cure properly, whereas others take great pains that the patient should not swallow a particle of the barley (thinking it would do much harm), but strain the juice through a cloth before giving it, others, again, will neither give thick ptisan nor the juice, some until the seventh day of the disease, and some until after the crisis. Physicians are not in the practice of mooted such questions, nor, perhaps, if mooted, would a solution of them be found, although the whole art is thereby exposed to much censure from the vulgar, who fancy that there really is no such science as medicine, since, in acute diseases, practitioners differ so much among themselves, that those things which one administers as thinking it the best that can be given, another holds to be bad, and, in this respect, they might say that the art of medicine resembles augury, since augurs hold that the same bird (omen) if seen on the left hand is good, but if on the right bad. And in divination by the inspection of entrails you will find similar differences, but certain diviners hold the very opposite of these opinions. I say, then, that this question is a most excellent one, and allied to very many others, some of the most vital importance in the Art, for that it can contribute much to the recovery of the sick, and to the preservation of health in the case of those who are well, and that it promotes the strength of those who use gymnastic exercises, and is useful to whatever one may wish to apply it.

4 Ptisan, then, appears to me to be justly preferred before all the other preparations from grain in these diseases, and I commend those who made this choice,³ for the mucilage of it is smooth, consistent, pleasant, lubricant, moderately diluent, quenches thirst if this be required, and has no astringency, gives no trouble nor swells up in the bowels, for in the boiling it swells up as much as it naturally can. Those, then, who make use of ptisan in such diseases, should never for a day allow their vessels to be empty of it, if I may say so, but should use it and not intermit, unless it be necessary to stop for a time, in order to administer medicine or a clyster. And to those who are accustomed to take two meals in the day it is to be given twice, and to those accustomed to live upon a single meal it is to be given once at first, and then, if the case permit, it is to be increased and given twice to them, if they appear to stand in need of it. At first it will be proper not to give a large quantity nor very thick, but in proportion to the quantity of food which one has been accustomed to take, and so as that the veins may not be much emptied. And, with regard to the augmentation of the dose, if the disease be of a drier nature than one had supposed, one must not give more of it, but should give before the draught of ptisan, either hydromel or wine, in as great quantity as may be proper, and what is proper in each case will be afterward stated by us. But if the mouth and the passages from the lungs be in a proper state as to moisture, the quantity of the draught is to be increased, as a general rule, for an early and abundant state of moisture indicates an early crisis, but a late and deficient moisture indicates a slower crisis. And these things are as I have stated for the most part, but many other things are omitted which are important to the prognosis, as will be explained afterwards. And the more

³ Our author now enters upon the consideration of one of his principal objects in the present work, namely, to describe the modes of preparing ptisan (or the decoction of barley), and its uses in acute diseases. He is so full on this subject that the present treatise is quoted by Athenæus (*Deipnos* 11, 16), by the name of the work *On the Ptisan*. Galen states that, on the principle that diseases are to be cured by their contraries, as the essence of a febrile disease is combined of heat and dryness, the indication of a cure is to use means of a cooling and moistening nature, and that the ptisan fulfils both these objects.

that the patient is troubled with purging, in so much greater quantity is it to be given until the crisis, and moreover until two days beyond the crisis, in such cases as it appears to take place on the fifth, seventh, or ninth day, so as to have respect both for the odd and even day after this the draught is to be given early in the day, and the other food in place is to be given in the evening These things are proper, for the most part, to be given to those who, from the first, have used ptisan containing its whole substance, for the pains in pleuritic affections immediately cease of their own accord whenever the patients begin to expectorate anything worth mentioning, and the purgings become much better, and empyema much more seldom takes place, than if the patients used a different regimen, and the crises are more simple, occur earlier, and the cases are less subject to relapses

5. Ptisans are to be made of the very best barley, and are to be well boiled, more especially if you do not intend to use them strained For, besides the other virtues of ptisan, its lubricant quality prevents the barley that is swallowed from proving injurious, for it does not stick nor remain in the region of the breast, for that which is well boiled is very lubricant, excellent for quenching thirst, of very easy digestion, and very weak, all which qualities are wanted If, then, one do not pay proper attention to the mode of administering the ptisan, much harm may be done, for when the food is shut up in the bowels, unless one procure some evacuation speedily, before administering the draught, the pain, if present, will be exasperated, and, if not present, it will be immediately created, and the respiration will become more frequent, which does mischief, for it dries the lungs, fatigues the hypochondria, the hypogastrium, and diaphragm And moreover if, while the pain of the side persists, and does not yield to warm fomentations, and the sputa are not brought up, but are viscid and unconcocted, unless one get the pain resolved, either by loosening the bowels, or opening a vein, whichever of these may be proper,—if to persons so circumstanced ptisan be administered, their speedy death will be the result For these reasons, and for others of a similar kind still more, those who use unstrained ptisan die on the seventh day, or still earlier, some

being seized with delirium, and others dying suffocated with orthopnoë and râles. Such persons the ancients thought *struck*, for this reason more especially, that when dead the affected side was livid, like that of a person who had been struck. The cause of this is that they die before the pain is resolved, being seized with difficulty of respiration, and by large and rapid breathing, as has been already explained, the spittle becoming thick, acid, and unconcocted, cannot be brought up, but, being retained in the bronchi of the lungs, produces râles, and, when it has come to this, death, for the most part, is inevitable, for the sputa being retained prevent the breath from being drawn in, and force it speedily out, and thus the two conspire together to aggravate the mischief, for the sputa being retained renders the respiration frequent, while the respiration being frequent thickens the sputa, and prevents them from being evacuated. These symptoms supervene, not only if ptisan be administered unseasonably, but still more if any other food or drink worse than ptisan be given.

6 For the most part, then, the results are the same, whether the patient have used the unstrained ptisan or have used the juice alone, or even only drink, and sometimes it is necessary to proceed quite differently. In general, one should do thus: if fever commences shortly after taking food, and before the bowels have been evacuated, whether with or without pain, the physician ought to withhold the draught until he thinks that the food has descended to the lower part of the belly, and if any pain be present, the patient should use oxymel, hot if it is winter, and cold if it is summer, and, if there be much thirst, he should take hydromel and water. Then, if any pain be present, or any dangerous symptoms make their appearance, it will be proper to give the draught neither in large quantity nor thick, but after the seventh day, if the patient be strong. But if the earlier-taken food has not descended, in the case of a person who has recently swallowed food, and if he be strong and in the vigor of life, a clyster should be given, or if he be weaker, a suppository is to be administered, unless the bowels open properly of themselves. The time for administering the draught is to be particularly observed at the commencement and during the whole illness, when, then, the feet

are cold, one should refrain from giving the ptisan, and more especially abstain from drink, but when the heat has descended to the feet, one may then give it, and one should look upon this season as of great consequence in all diseases, and not least in acute diseases, especially those of a febrile character, and those of a very dangerous nature. One may first use the juice, and then the ptisan, attending accurately to the rules formerly laid down.

7 When pain seizes the side, either at the commencement or at a later stage, it will not be improper to try to dissolve the pain by hot applications. Of hot applications the most powerful is hot water in a bottle, or bladder, or in a brazen vessel, or in an earthen one, but one must first apply something soft to the side, to prevent pain. A soft large sponge, squeezed out of hot water and applied, forms a good application, but it should be covered up above, for thus the heat will remain the longer, and at the same time the vapor will be prevented from being carried up to the patient's breath, unless when this is thought of use, for sometimes it is the case. And further, barley or tares may be infused and boiled in diluted vinegar, stronger than that it could be drunk, and may then be sewed into bladders and applied, and one may use bran in like manner. Salts or toasted millet in woolen bags are excellent for forming a dry fomentation, for the millet is light and soothing. A soft fomentation like this soothes pains, even such as shoot to the clavicle. Venesection, however, does not alleviate the pain unless when it extends to the clavicle. But if the pain be not dissolved by the fomentations, one ought not to foment for a length of time, for this dries the lungs and promotes suppuration, but if the pain point to the clavicle, or if there be a heaviness in the arm, or about the breast, or above the diaphragm, one should open the inner vein at the elbow, and not hesitate to abstract a large quantity, until it become much redder, or instead of being pure red, it turns livid, for both these states occur. But if the pain be below the diaphragm, and do not point to the clavicle, we must open the belly either with black hellebore or peplum, mixing the black hellebore with carrot or seseli, or cumin, or anise, or any other of the fragrant herbs, and with the peplum the juice of sulphium (asafœtida), for these substances,

when mixed up together, are of a similar nature The black hellebore acts more pleasantly and effectually than the peplum, while, on the other hand, the peplum expels wind much more effectually than the black hellebore, and both these stop the pain, and many other of the laxatives also stop it, but these two are the most efficacious that I am acquainted with And the laxatives given in draughts are beneficial, when not very unpalatable owing to bitterness, or any other disagreeable taste, or from quantity, color, or any apprehension When the patient has drunk the medicine, one ought to give him to swallow but little less of the ptisan than what he had been accustomed to, but it is according to rule not to give any draughts while the medicine is under operation, but when the purging is stopped then he should take a smaller draught than what he had been accustomed to, and afterwards go on increasing it progressively, until the pain cease, provided nothing else contra-indicate This is my rule, also, if one would use the juice of ptisan, (for I hold that it is better, on the whole, to begin with taking the decoction at once, rather than by first emptying the veins before doing so, or on the third, fourth, fifth, sixth, or seventh day, provided the disease has not previously come to a crisis in the course of this time), and similar preparations to those formerly described are to be made in those cases

8 Such are the opinions which I entertain respecting the administering of the ptisan, and, as regards drinks, whichever of those about to be described may be administered, the same directions are generally applicable And here I know that physicians are in the practice of doing the very reverse of what is proper, for they all wish, at the commencement of diseases, to starve their patients for two, three, or more days, and then to administer the ptisans and drinks, and perhaps it appears to them reasonable that, as a great change has taken place in the body, it should be counteracted by another great change Now, indeed, to produce a change is no small matter, but the change must be effected well and cautiously, and after the change the administration of food must be conducted still more so Those persons, then, would be most injured if the change is not properly managed, who used

unstrained ptisans, they also would suffer who made use of the juice alone, and so also they would suffer who took merely drink, but these least of all

9 One may derive information from the regimen of persons in good health what things are proper, for if it appear that there is a great difference whether the diet be so and so, in other respects, but more especially in the changes, how can it be otherwise in diseases, and more especially in the most acute? But it is well ascertained that even a faulty diet of food and drink steadily persevered in, is safer in the main as regards health than if one suddenly change it to another. Wherefore, in the case of persons who take two meals in the day, or of those who take a single meal, sudden changes induce suffering and weakness, and thus persons who have not been accustomed to dine, if they shall take dinner, immediately become weak, have heaviness over their whole body, and become feeble and languid, and if, in addition, they take supper, they will have acid eructations, and some will have diarrhœa whose bowels were previously dry, and not having been accustomed to be twice swelled out with food and to digest it twice a day, have been loaded beyond their wont. It is beneficial, in such cases, to counterbalance this change, for one should sleep after dinner, as if passing the night, and guard against cold in winter and heat in summer, or, if the person cannot sleep, he may stroll about slowly, but without making stops, for a good while, take no supper, or, at all events, eat little, and only things that are not unwholesome, and still more avoid drink, and especially water. Such a person will suffer still more if he take three full meals in the day, and more still if he take more meals, and yet there are many persons who readily bear to take three full meals in the day, provided they are so accustomed. And, moreover, those who have been in the habit of eating twice a day, if they omit dinner, become feeble and powerless, averse to all work, and have heartburn, their bowels seem, as it were, to hang loose, their urine is hot and green, and the excrement is parched, in some the mouth is bitter, the eyes are hollow, the temples throb, and the extremities are cold, and the most of those who have thus missed their dinner cannot eat supper, or, if they do

sup, they load their stomach, and pass a much worse night than if they had previously taken dinner. Since, then, an unwonted change of diet for half a day produces such effects upon persons in health, it appears not to be a good thing either to add or take from. If, then, he who was restricted to a single meal, contrary to usage, having his veins thus left empty during a whole day, when he supped according to custom felt heavy, it is probable that if, because he was uneasy and weak from the want of dinner, he took a larger supper than wont, he would be still more oppressed, or if, wanting food for a still greater interval, he suddenly took a meal after supper, he will feel still greater oppression. He, then, who, contrary to usage, has had his veins kept empty by want of food, will find it beneficial to counteract the bad effects during that day as follows: let him avoid cold, heat, and exertion, for he could bear all these ill, let him make his supper considerably less than usual, and not of dry food, but rather liquid, and let him take some drink, not of a watery character, nor in smaller quantity than is proportionate to the food, and on the next day he should take a small dinner, so that, by degrees, he may return to his former practice. Persons who are bilious in the stomach bear these changes worst, while those who are pituitous, upon the whole, bear the want of food best, so that they suffer the least from being restricted to one meal in the day, contrary to usage. This, then, is a sufficient proof that the greatest changes as to those things which regard our constitutions and habits are most especially concerned in the production of diseases, for it is impossible to produce unseasonably a great emptying of the vessels by abstinence, or to administer food while diseases are at their acme, or when inflammation prevails, nor, on the whole, to make a great change either one way or another with impunity.

10 One might mention many things akin to these respecting the stomach and bowels, to show how people readily bear such food as they are accustomed to, even if it is not naturally good, and drink in like manner, and how they bear unpleasantly such food as they are not accustomed to, even although not bad, and so in like manner with drink, and as to the effects of eating much flesh, contrary to usage, or garlic, or asafœtida, or the stem of the

plant which produces it, or things of a similar kind possessed of strong properties, one would be less surprised if such things produce pains in the bowels, but rather when one learned what trouble, swelling, flatulence, and tormina the cake (maza) will raise in the belly when eaten by a person not accustomed to it, and how much weight and distention of the bowels bread will create to a person accustomed to live upon the maza, and what thirst and sudden fullness will be occasioned by eating hot bread, owing to its desiccant and indigestible properties, and what different effects are produced by fine and coarse bread when eaten contrary to usage, or by the cake when usually dry, moist, or viscid, and what different effects polenta produces upon those who are accustomed and those who are unaccustomed to the use of it, or drinking of wine or drinking of water, when either custom is suddenly exchanged for the other, or when, contrary to usage, diluted wine or undiluted has been suddenly drunk, for the one will create water-brash in the upper part of the intestinal canal and flatulence in the lower, while the other will give rise to throbbing of the arteries, heaviness of the head, and thirst, and white and dark-colored wine, although both strong wines, if exchanged contrary to usage, will produce very different effects upon the body, so that one need the less wonder that a sweet and strong wine, if suddenly exchanged, should have by no means the same effect

11 Let us here briefly advert to what may be said on the opposite side, namely, that a change of diet has occurred in these cases, without any change in their body, either as to strength, so as to require an increase of food, or as to weakness, so as to require a diminution. But the strength of the patient is to be taken into consideration, and the manner of the disease, and of the constitution of the man, and the habitual regimen of the patient, not only as regards food but also drink. Yet one must much less resort to augmentation, since it is often beneficial to have recourse to abstraction, when the patient can bear it, until the disease having reached its acme and has become concocted. But in what cases this must be done will be afterwards described. One might write many other things akin to those which have been

now said, but there is a better proof, for it is not akin to the matter on which my discourse has principally turned, but the subject-matter itself is a most seasonable proof. For some at the commencement of acute diseases have taken food on the same day, some on the next day, some have swallowed whatever has come in their way, and some have taken *cyceon* ⁴. Now all these things are worse than if one had observed a different regimen, and yet these mistakes, committed at that time, do much less injury than if one were to abstain entirely from food for the first two or three days, and on the fourth or fifth day were to take such food, and it would be still worse, if one were to observe total abstinence for all these days, and on the following days were to take such a diet, before the disease is concocted, ⁵ for in this way death would be the consequence to most people, unless the disease were of a very mild nature. But the mistakes committed at first were not so irremediable as these, but could be much more easily repaired. This, therefore, I think a strong proof that such or such a draught need not be prescribed on the first days to those who will use the same draughts afterwards. At the bottom, therefore, they do not know, neither those using unstrained ptisans, that they are hurt by them, when they begin to swallow them, if they abstain entirely from food for two, three, or more days, nor do those using the juice know that they are injured in swallowing them, when they do not commence with the draught seasonably. But this they guard against, and know that it does much mischief, if, before the disease be concocted, the patient swallow unstrained ptisan, when accustomed to use strained. All these things are strong proofs that physicians do not conduct the regimen of patients properly, but that in those diseases in

⁴ The *cyceon* was a mixture of various articles of food, but generally contained cheese, honey, and wine. See Athenæus (Deipnos, 11). It is described by Homer as the potion which Circe administered to the followers of Ulysses (Odys. x, 235). There is frequent mention of it in the Hippocratic treatises, as at De Dietis, 11, de Muliebribus, 11, and in the works of the other medical authors.

⁵ The meaning here is somewhat obscure, but appears to be this: that if a patient fast for the first two or three days, and take food of a heavy nature on the fourth or fifth, he will be much injured, but that the mistake will be still more fatal if the fast be continued for the first four or five days, and if he then indulge freely in food at the end of these

which total abstinence from food should not be enforced on patients that will be put on the use of ptisans, they do enforce total abstinence, that in those cases in which there should be no change made from total abstinence to ptisans, they do make the change, and that, for the most part, they change from abstinence to ptisans, exactly at the time when it is often beneficial to proceed from ptisans almost to total abstinence, if the disease happen to be in the state of exacerbation. And sometimes crude matters are attracted from the head, and bilious from the region near the chest, and the patients are attacked with insomnolency, so that the disease is not concocted, they become sorrowful, peevish, and delirious, there are flashes of light in their eyes, and noises in their ears; their extremities are cold, their urine unconcocted, the sputa thin, saltish, tinged with an intense color and smell, sweats about the neck, and anxiety, respiration, interrupted in the expulsion of the air, frequent and very large, expression of the eyelids dreadful, dangerous *deliquia*, tossing of the bed-clothes from the breast, the hands trembling, and sometimes the lower lip agitated. These symptoms, appearing at the commencement, are indicative of strong delirium, and patients so affected generally die, or if they escape, it is with a deposit, hemorrhage from the nose, or the expectoration of thick matter, and not otherwise. Neither do I perceive that physicians are skilled in such things as these, how they ought to know such diseases as are connected with debility, and which are further weakened by abstinence from food, and those aggravated by some other irritation, those by pain, and from the acute nature of the disease, and what affections and various forms thereof our constitution and habit engender, although the knowledge or ignorance of such things brings safety or death to the patient. For it is a great mischief if to a patient debilitated by pain, and the acute nature of the disease, one administer drink, or more ptisan, or food, supposing that the debility proceeds from inanition. It is also disgraceful not to recognize a patient whose debility is connected with inanition, and to pinch him in his diet, this mistake, indeed, is attended with some danger, but much less than the other, and yet it is likely to expose one to much greater derision, for if another physician, or a private

person, coming in and knowing what has happened, should give to eat or drink those things which the other had forbidden, the benefit thus done to the patient would be manifest. Such mistakes of practitioners are particularly ridiculed by mankind, for the physician or non-professional man thus coming in, seems as it were to resuscitate the dead. On this subject I will describe elsewhere the symptoms by which each of them may be recognized.

12 And the following observations are similar to those now made respecting the bowels. If the whole body rest long, contrary to usage, it does not immediately recover its strength, but if, after a protracted repose, it proceed to labor, it will clearly expose its weakness. So it is with every one part of the body, for the feet will make a similar display, and any other of the joints, if, being unaccustomed to labor, they be suddenly brought into action, after a time. The teeth and the eyes will suffer in like manner, and also every other part whatever. A couch, also, that is either softer or harder than one has been accustomed to will create uneasiness, and sleeping in the open air, contrary to usage, hardens the body. But it is sufficient merely to state examples of all these cases. If a person having received a wound in the leg, neither very serious nor very trifling, and he being neither in a condition very favorable to its healing nor the contrary, at first betakes himself to bed, in order to promote the cure, and never raises his leg, it will thus be much less disposed to inflammation, and be much sooner well, than it would have been if he had strolled about during the process of healing, but if upon the fifth or sixth day, or even earlier, he should get up and attempt to walk, he will suffer much more than if he had walked about from the commencement of the cure, and if he should suddenly make many laborious exertions, he will suffer much more than if, when the treatment was conducted otherwise, he had made the same exertions on the same days. In fine, all these things concur in proving that all great changes, either one way or another, are hurtful. Wherefore much mischief takes place in the bowels, if from a state of great inanition more food than is moderate be administered (and also in the rest of the body,

if from a state of great rest it be hastily brought to greater exertion, it will be much more injured), or if from the use of much food it be changed to complete abstinence, and therefore the body in such cases requires protracted repose, and if, from a state of laborious exertion, the body suddenly falls into a state of ease and indolence, in these cases also the bowels would require continued repose from abundance of food, for otherwise it will induce pain and heaviness in the whole body

13 The greater part of my discourse has related to changes, this way or that For all purposes it is profitable to know these things, and more expecially respecting the subject under consideration,—that in acute diseases, in which a change is made to ptisans from a state of inanition, it should be made as I direct, and then that ptisans should not be used until the disease be concocted, or some other symptom, whether of evacuation or of irritation, appear in the intestines, or in the hypochondria, such as will be described Obstinate insomnolency impairs the digestion of the food and drink, and in other respects changes and relaxes the body, and occasions a heated state, and heaviness of the head ⁶

14 One must determine by such marks as these, when sweet, strong, and dark wine, hydromel, water and oxymel, should be given in acute diseases Wherefore the sweet affects the head less than the strong, attacks the brain less, evacuates the bowels more than the other, but induces swelling of the spleen and liver, it does not agree with bilious persons, for it causes them to thirst, it creates flatulence in the upper part of the intestinal canal, but does not disagree with the lower part, as far as regards flatulence, and yet flatulence engendered by sweet wine is not of a transient nature, but rests for a long time in the hypochondria And therefore it in general is less diuretic than wine which is strong and thin, but sweet wine is more expectorant than the other But when it creates thirst, it is less expectorant in such cases than the other wine, but if it do not create thirst, it promotes expecto-

⁶ Galen finds the language in this last sentence so confused, that he does not hesitate to declare that he is convinced the work must have been left by Hippocrates in an unfinished state, and not published until after his death

ration better than the other The good and bad effects of a white, strong wine, have been already frequently and fully stated in the disquisition on sweet wine, it is determined to the bladder more than the other, is diuretic and laxative, and should be very useful in such complaints, for if in other respects it be less suitable than the other, the clearing out of the bladder effected by it is beneficial to the patient, if properly administered There are excellent examples of the beneficial and injurious effects of wine, all which were left undetermined by my predecessors In these diseases you may use a yellow wine, and a dark austere wine for the following purposes if there be no heaviness of the head, nor delirium, nor stoppage of the expectoration, nor retention of the urine, and if the alvine discharges be more loose and like scrapings than usual, in such cases a change from a white wine to such as I have mentioned, might be very proper It deserves further to be known, that it will prove less injurious to all the parts above, and to the bladder, if it be of a more watery nature, but that the stronger it is, it will be the more beneficial to the bowels

15 Hydromel, when drunk in any stage of acute disease, is less suitable to persons of a bilious temperament, and to those who have enlarged viscera, than to those of a different character, it increases thirst less than sweet wine, it softens the lungs, is moderately expectorant, and alleviates a cough, for it has some detergent quality in it, whence it lubricates the sputum Hydromel is also moderately diuretic, unless prevented by the state of any of the viscera And it also occasions bilious discharges downwards, sometimes of a proper character, and sometimes more intense and frothy than is suitable, but such rather occurs in persons who are bilious, and have enlarged viscera Hydromel rather produces expectoration, and softening of the lungs, when given diluted with water But unmixed hydromel, rather than the diluted, produces frothy evacuations, such as are unseasonably and intensely bilious, and too hot, but such an evacuation occasions other great mischiefs, for it neither extinguishes the heat in the hypochondria, but rouses it, induces inquietude, and jactitation of the limbs, and ulcerates the intestines and anus The remedies for all these will be described afterwards B

using hydromel without ptisans, instead of any other drink, you will generally succeed in the treatment of such diseases, and fail in few cases, but in what instances it is to be given, and in what if is not to be given, and wherefore it is not to be given,—all this has been explained already, for the most part Hydromel is generally condemned, as if it weakened the powers of those who drink it, and on that account it is supposed to accelerate death, and this opinion arose from persons who starve themselves to death, some of whom use hydromel alone for drink, as fancying that it really has this effect But this is by no means always the case For hydromel, if drunk alone, is much stronger than water, if it do not disorder the bowels, but in some respects it is stronger, and in some weaker, than wine that is thin, weak, and devoid of *bouquet* There is a great difference between unmixed wine and unmixed honey, as to their nutritive powers, for if a man will drink double the quantity of pure wine, to a certain quantity of honey which is swallowed, he will find himself much stronger from the honey, provided it do not disagree with his bowels, and that his alvine evacuations from it will be much more copious But if he shall use ptisan for a draught, and drink afterward hydromel, he will feel full, flatulent, and uncomfortable in the viscera of the hypochondrium, but if the hydromel be taken before the draught, it will not have the same injurious effects as if taken after it, but will be rather beneficial And boiled hydromel has a much more elegant appearance than the unboiled, being clear, thin, white, and transparent, but I am unable to mention any good quality which it possesses that the other wants For it is not sweeter than the unboiled, provided the honey be fine, and it is weaker, and occasions less copious evacuations of the bowels, neither of which effects is required from the hydromel But one should by all means use it boiled, provided the honey be bad, impure, black, and not fragrant, for the boiling will remove the most of its bad qualities and appearances

16 You will find the drink, called oxymel, often very useful in these complaints, for it promotes expectoration and freedom of breathing The following are the proper occasions for administering it When strongly acid it has no mean operation in

rendering the expectoration more easy, for by bringing up the sputa, which occasion troublesome hawking, and rendering them more slippery, and, as it were, clearing the windpipe with a feather, it relieves the lungs and proves emollient to them, and when it succeeds in producing these effects it must do much good. But there are cases in which hydromel, strongly acid, does not promote expectoration, but renders it more viscid and thus does harm, and it is most apt to produce these bad effects in cases which are otherwise of a fatal character, when the patient is unable to cough or bring up the sputa. On this account, then, one ought to consider beforehand the strength of the patient, and if there be any hope, then one may give it, but if given at all in such cases it should be quite tepid, and in by no means large doses. But if slightly acrid it moistens the mouth and throat, promotes expectoration, and quenches thirst, agrees with the viscera seated in the hypochondrium, and obviates the bad effects of the honey, for the bilious quality of the honey is thereby corrected. It also promotes flatulent discharges from the bowels, and is diuretic, but it occasions watery discharges and those resembling scrapings, from the lower part of the intestine, which is sometimes a bad thing in acute diseases, more especially when the flatulence cannot be passed, but rolls backwards, and otherwise it diminishes the strength and makes the extremities cold, this is the only bad effect worth mentioning which I have known to arise from the oxymel. It may suit well to drink a little of this at night before the draught of ptisan, and when a considerable interval of time has passed after the draught there will be nothing to prevent its being taken. But to those who are restricted entirely to drinks without draughts of ptisan, it will therefore not be proper at all times to give it, more especially from the fretting and irritation of the intestine which it occasions, (and these bad effects it will be the more apt to produce provided there be no *fæces* in the intestines and the patient is laboring under inanition,) and then it will weaken the powers of the hydromel. But if it appears advantageous to use a great deal of this drink during the whole course of the disease, one should add to it merely as much vinegar as can just be perceived by the taste, for thus what is

prejudicial in it will do the least possible harm, and what is beneficial will do the more good. In a word, the acidity of vinegar agrees rather with those who are troubled with bitter bile, than with those patients whose bile is black, for the bitter principle is dissolved in it and turned to phlegm, by being suspended in it, whereas black bile is fermented, swells up, and is multiplied thereby for vinegar is a melanagogue. Vinegar is more prejudicial to women than to men, for it creates pains in the uterus.

17 I have nothing further to add as to the effects of water when used as a drink in acute diseases, for it neither soothes the cough in pneumonia, nor promotes expectoration, but does less than the others in this respect, if used alone through the whole complaint. But if taken intermediate between oxymel and hydromel, in small quantity, it promotes expectoration from the change which it occasions in the qualities of these drinks, for it produces, as it were, a certain overflow. Otherwise it does not quench the thirst, for it creates bile in a bilious temperament, and is injurious to the hypochondrium, and it does the most harm, engenders most bile, and does the least good when the bowels are empty, and it increases the swelling of the spleen and liver when they are in an inflamed state, it produces a gurgling noise in the intestines and swims on the stomach, for it passes slowly downwards, as being of a coldish and indigestible nature, and neither proves laxative nor diuretic, and in this respect, too, it proves prejudicial, that it does not naturally form fæces in the intestines and, if it be drunk while the feet are cold, its injurious effects will be greatly aggravated, in all those parts to which it may be determined. When you suspect in these diseases either strong heaviness of the head, or mental alienation, you must abstain entirely from wine, and in this case use water, or give weak, straw-colored wine, entirely devoid of *bouquet*, after which a little water is to be given in addition, for thus the strength of the wine will less affect the head and the understanding but in which cases water is mostly to be given for drink, when in large quantity, when in moderate, when cold, and when hot, all these things have either been discussed already or will be treated of at the proper time. In like manner, with respect to all the others, such as barley-water, the

drinks made from green shoots, those from raisins, and the skins of grapes and wheat, and bastard saffron, and myrtles, pomegranates, and the others, when the proper time for using them is come, they will be treated of along with the disease in question, in like manner as the other compound medicines

18 The bath is useful in many diseases, in some of them when used steadily, and in others when not so. Sometimes it must be less used than it would be otherwise, from the want of accommodation, for in few families are all the conveniences prepared, and persons who can manage them as they ought to be. And if the patient be not bathed properly, he may be thereby hurt in no inconsiderable degree, for there is required a place to cover him that is free of smoke, abundance of water, materials for frequent baths, but not very large, unless this should be required. It is better that no friction should be applied, but if so, a hot soap (*smegma*) must be used in greater abundance than is common, and an affusion of a considerable quantity of water is to be made at the same time and afterwards repeated. There must also be a short passage to the basin, and it should be of easy ingress and egress. But the person who takes the bath should be orderly and reserved in his manner, should do nothing for himself, but others should pour the water upon him and rub him, and plenty of waters, of various temperatures, should be in readiness for the *douche*, and the affusions quickly made, and sponges should be used instead of the comb (*strigil*), and the body should be anointed when not quite dry. But the head should be rubbed by the sponge until it is quite dry, the extremities should be protected from cold, as also the head and the rest of the body, and a man should not be washed immediately after he has taken a draught of ptisan or a drink, neither should he take ptisan as a drink immediately after the bath. Much will depend upon whether the patient, when in good health, was very fond of the bath, and in the custom of taking it. For such persons, especially, feel the want of it, and are benefited if they are bathed, and injured if they are not. In general it suits better with cases of pneumonia than in ardent fevers, for the bath soothes the pain in the side, chest, and back, concocts the sputa, promotes expectoration,

improves the respiration, and allays lassitude, for it soothes the joints and outer skin, and is diuretic, removes heaviness of the head, and moistens the nose. Such are the benefits to be derived from the bath, if all the proper requisites be present, but if one or more of these be wanting, the bath, instead of doing good, may rather prove injurious, for every one of them may do harm if not prepared by the attendants in the proper manner. It is by no means a suitable thing in these diseases to persons whose bowels are too loose, or when they are unusually confined, and there has been no previous evacuation, neither must we bathe those who are debilitated, nor such as have nausea or vomiting, or bilious eructations, nor such as have hemorrhage from the nose, unless it be less than required at that stage of the disease, (with those stages you are acquainted) but if the discharge be less than proper, one should use the bath, whether in order to benefit the whole body or the head alone. If then the proper requisites be at hand, and the patient be well disposed to the bath, it may be administered once every day, or if the patient be fond of the bath there will be no harm, though he should take it twice in the day. The use of the bath is much more appropriate to those who take unstrained ptilin, than to those who take only the juice of it, although even in their case it may be proper, but least of all does it suit with those who use only plain drink, although, in their case too it may be suitable, but one must form a judgment from the rules laid down before, in which of these modes of regimen the bath will be beneficial, and in which not. Such as want some of the requisites for a proper bath, but have those symptoms which would be benefited by it, should be bathed, whereas those who want none of the proper requisites, but have certain symptoms which contraindicate the bath, are not to be bathed.

APPENDIX

Ardent fever (causus) takes place when the veins, being dried up in the summer season, attract acrid and bilious humors to themselves, and strong fever seizes the whole body, which experiences aches of the bones, and is in a state of lassitude and

pain It takes place most commonly from a long walk and protracted thirst, when the veins being dried up attract acrid and hot defluxions to themselves The tongue becomes rough, dry, and very black, there are gnawing pains about the bowels, the alvine discharges are watery and yellow, there is intense thirst, insomnolency, and sometimes wandering of the mind To a person in such a state give to drink water and as much boiled hydromel of a watery consistence as he will take, and if the mouth be bitter, it may be advantageous to administer an emetic and clyster, and if these things do not loosen the bowels, purge with the boiled milk of asses Give nothing saltish nor acrid, for they will not be borne, and give no draughts of ptisan until the crisis be past And the affection is resolved if there be an epistaxis, or if true critical sweats supervene with urine having white, thick, and smooth sediments, or if a deposit take place anywhere, but if it be resolved without these, there will be a relapse of the complaint, or pain in the hips and legs will ensue, with thick sputa, provided the patient be convalescent Another species of ardent fever belly loose, much thirst, tongue rough, dry, and saltish, retention of urine, insomnolency, extremities cold In such a case, unless there be a flow of blood from the nose, or an abscess form about the neck, or pain in the limbs, or the patient expectorate thick sputa (these occur when the belly is constipated), or pain of the hips, or lividity of the genital organs, there is no crisis, tension of the testicle is also a critical symptom Give attractive draughts

2 Bleed in the acute affections, if the disease appear strong, and the patients be in the vigor of life, and if they have strength If it be quinsy or any other of the pleuritic affections, purge with electuaries, but if the patient be weaker, or if you abstract more blood, you may administer a clyster every third day, until he be out of danger, and enjoin total abstinence if necessary

3 Hypochondria inflamed not from retention of flatus, tension of the diaphragm, checked respiration, with dry orthopnœa, when no pus is formed, but when these complaints are connected with obstructed respiration, but more especially strong pains of the liver, heaviness of the spleen, and other phlegmasiæ and in-

tense pains above the diaphragm, diseases connected with collections of humors,—all these diseases do not admit of resolution, if treated at first by medicine, but venesection holds the first place in conducting the treatment, then we may have recourse to a clyster, unless the disease be great and strong, but if so, purging also may be necessary, but bleeding and purging together require caution and moderation. Those who attempt to resolve inflammatory diseases at the commencement by the administration of purgative medicines, remove none of the morbid humors which produce the inflammation and tension, for the diseases while unconcocted could not yield, but they melt down those parts which are healthy and resist the disease, so when the body is debilitated the malady obtains the mastery, and when the disease has the upper hand of the body, it does not admit of a cure.

4 When a person suddenly loses his speech, in connection with obstruction of the veins,—if this happen without warning or any other strong cause, one ought to open the internal vein of the right arm, and abstract blood more or less according to the habit and age of the patient. Such cases are mostly attended with the following symptoms: redness of the face, eyes fixed, hands distended, grinding of the teeth, palpitations, jaws fixed, coldness of the extremities, retention of airs in the veins.

5 When pains precede, and there are influxes of black bile and of acrid humors, and when by their pungency the internal parts are pained, and the veins being pinched and dried become distended, and getting inflamed attract the humors running into the parts, whence the blood being vitiated, and the airs collected there not being able to find their natural passages, coldness comes on in consequence of this stasis, with vertigo, loss of speech, heaviness of the head, and convulsion, if the disease fix on the liver, the heart, or the great vein (*vena cava*?), whence they are seized with epilepsy or apoplexy, if the defluxions fall upon the containing parts, and if they are dried up by airs which cannot make their escape, such persons having been first fomented are to be immediately bled at the commencement, while all the peccant vapors and humors are buoyant, for then the cases more easily admit of a cure, and then supporting the strength and

attending to the crisis, we may give emetics, unless the disease be alleviated, or if the bowels be not moved, we may administer a clyster and give the boiled milk of asses, to the amount of not less than twelve heminæ, or if the strength permit, to more than sixteen

6 Quinsy takes place when a copious and viscid defluxion from the head, in the season of winter or spring, flows into the jugular veins, and when from their large size they attract a greater defluxion, and when owing to the defluxion being of a cold and viscid nature it becomes enfarcted, obstructing the passages of the respiration and of the blood, coagulates the surrounding blood, and renders it motionless and stationary, it being naturally cold and disposed to obstructions. Hence they are seized with convulsive suffocation, the tongue turning livid, assuming a rounded shape, and being vent owing to the veins which are seated below the tongue (for when an enlarged uvula, which is called *uva*, is cut, a large vein may be observed on each side). These veins, then, becoming filled, and their roots extending into the tongue, which is of a loose and spongy texture, it, owing to its dryness receiving forcibly the juice from the veins, changes from broad and becomes round, its natural color turns to livid, from a soft consistence it grows hard, instead of being flexible it becomes inflexible, so that the patient would soon be suffocated unless speedily relieved. Bleeding, then, in the arm, and opening the sublingual veins, and purging with the electuaries, and giving warm gargles, and shaving the head, we must apply to it and the neck a cerate, and wrap them round with wool, and foment with soft sponges squeezed out of hot water, give to drink water and hydromel, not cold, and administer the juice of ptisan when, having passed the crisis, the patient is out of danger. When, in the season of summer or autumn, there is a hot and nitrous defluxion from the head (it is rendered hot and acrid by the season), being of such a nature it corrodes and ulcerates, and fills with air, and orthopnœa attended with great dryness supervenes, the fauces, when examined, do not seem swollen, the tendons on the back part of the neck are contracted, and have the appearance as if it were tetanus, the voice is lost, the breathing is small, and

inspiration becomes frequent and laborious In such persons the trachea becomes ulcerated, and the lungs engorged, from the patient's not being able to draw in the external air. In such cases, unless there be a spontaneous determination to the external parts of the neck, the symptoms become still more dreadful, and the danger more imminent, partly owing to the season, and the hot and acrid humors which cause the disease

7 When fever seizes a person who has lately taken food, and whose bowels are loaded with fæces which have been long retained, whether it be attended with pain of the side or not, he ought to lie quiet until the food descend to the lower region of the bowels, and use oxymel for drink, but when the load descends to the loins, a clyster should be administered, or he should be purged by medicine, and when purged, he should take ptisan for food and hydromel for drink, then he may take the cerealia, and boiled fishes, and a watery wine in small quantity, at night, but during the day, a watery hydromel When the flatus is offensive, either a suppository or clyster is to be administered, but otherwise the oxymel is to be discontinued, until the matters descend to the lower part of the bowels, and then they are to be evacuated by a clyster But if the ardent fever (*causus*) supervene when the bowels are empty, should you still judge it proper to administer purgative medicine, it ought not be done during the first three days, nor earlier than the fourth When you give the medicine, use the ptisan, observing the paroxysms of the fevers, so as not to give it when the fever is setting in, but when it is ceasing, or on the decline, and as far as possible from the commencement When the feet are cold, give neither drink nor ptisan, nor anything else of the kind, but reckon it an important rule to refrain until they become warm, and then you may administer them with advantage For the most part, coldness of the feet is a symptom of a paroxysm of the fever coming on, and if at such a season you apply those things, you will commit the greatest possible mistake, for you will augment the disease in no small degree But when the fever ceases, the feet, on the contrary, become hotter than the rest of the body, for when the heat leaves the feet, it is kindled up in the breast, and sends its flame up to the head And when

all the heat rushes upwards, and is exhaled at the head, it is not to be wondered at that the feet become cold, being devoid of flesh, and tendinous, and besides, they contract cold, owing to their distance from the hotter parts of the body, an accumulation of heat having taken place in the chest and again, in like manner, when the fever is resolved and dissipated, the heat descends to the feet, and, at the same time, the head and chest become cold Wherefore one should attend to this, that when the feet are cold, the bowels are necessarily hot, and filled with nauseous matters, the hypochondrium distended there is jactitation of the body, owing to the internal disturbance, and aberration of the intellect, and pains, the patient is agitated, and wishes to vomit, and if he vomits bad matters he is pained, but when the heat descends to the feet, and the urine passes freely, he is every way lightened, even although he does not sweat, at this season, then, the ptisan ought to be given, it would be death to give it before

8 When the bowels are loose during the whole course of fevers, in this case we are most especially to warm the feet, and see that they are properly treated with cerates, and wrapped in shawls, so that they may not become colder than the rest of the body, but when they are hot, no fomentation must be made to them, but care is to be taken that they do not become cold, and very little drink is to be used, either cold water or hydromel In those cases of fever where the bowels are loose, and the mind is disordered, the greater number of patients pick the wool from their blankets, scratch their noses, answer briefly when questions are put to them, but, when left to themselves, utter nothing that is rational Such attacks appear to me to be connected with black bile When in these cases there is a colliquative diarrhœa, I am of opinion that we ought to give the colder and thicker ptisans, and that the drinks ought to be binding, of a vinous nature, and rather astringent In cases of fever attended from the first with vertigo, throbbing of the head, and thin urine, you may expect the fever to be exacerbated at the crisis, neither need it excite wonder, although there be delirium When, at the commencement, the urine is cloudy or thick, it is proper to purge gently, provided this be otherwise proper, but when the urine at first is

thin, do not purge such patients, but, if thought necessary, give a clyster, such patients should be thus treated, they should be kept in a quiet state, have unguents applied to them, and be covered up properly with clothes, and they should use for drink a watery hydromel, and the juice of ptisan as a draught in the evening, clear out the bowels at first with a clyster, but give no purgative medicines to them, for, if you move the bowels strongly, the urine is not concocted, but the fever remains long, without sweats and without a crisis Do not give draughts when the time of the crisis is at hand, if there be agitation, but only when the fever abates and is alleviated It is proper to be guarded at the crises of other fevers, and to withhold the draughts at that season Fevers of this description are apt to be protracted, and to have determinations, if the inferior extremities be cold, about the ears and neck, or, if these parts are not cold, to have other changes, they have epistaxis, and disorder of the bowels. But in cases of fever attended with nausea, or distention of the hypochondria, when the patients cannot lie reclined in the same position, and the extremities are cold, the greatest care and precaution are necessary, nothing should be given to them, except oxymel diluted with water, no draught should be administered, until the fever abate and the urine be concocted, the patient should be laid in a dark apartment, and recline upon the softest couch, and he should be kept as long as possible in the same position, so as not to toss about, for this is particularly beneficial to him Apply to the hypochondrium linseed by inunctions, taking care that he do not catch cold when the application is made, let it be in a tepid state, and boiled in water and oil One may judge from the urine what is to take place, for if the urine be thicker, and more yellowish, so much the better, but if it be thinner, and blacker, so much the worse, but if it undergo changes, it indicates a prolongation of the disease, and the patient, in like manner, must experience a change to the worse and the better Irregular fevers should be let alone until they become settled, and, when they do settle, they are to be treated by a suitable diet and medicine, attending to the constitution of the patient

9 The aspects of the sick are various, wherefore the physician

should pay attention, that he may not miss observing the exciting causes, as far as they can be ascertained by reasoning, nor such symptoms as should appear on an even or odd day, but he ought to be particularly guarded in observing the odd days, as it is in them, more especially, that changes take place in patients. He should mark, particularly, the first day on which the patient became ill, considering when and whence the disease commenced, for this is of primary importance to know. When you examine the patient, inquire into all particulars, first how the head is, and if there be no headache, nor heaviness in it, then examine if the hypochondria and sides be free of pain, for if the hypochondrium be painful, swelled, and unequal, with a sense of satiety, or if there be pain in the side, and, along with the pain, either cough, tormina, or belly-ache, if any of these symptoms be present in the hypochondrium, the bowels should be opened with clysters, and the patient should drink boiled hydromel in a hot state. The physician should ascertain whether the patient be apt to faint when he is raised up, and whether his breathing be free, examine the discharges from the bowels, whether they be very black, or of a proper color, like those of persons in good health, and ascertain whether the fever has a paroxysm every third day, and look well to such persons on those days. And should the fourth day prove like the third, the patient is in a dangerous state. With regard to the symptoms, black stools prognosticate death, but if they resemble the discharges of a healthy person, and if such is their appearance every day, it is a favorable symptom, but when the bowels do not yield to a suppository, and when, though the respiration be natural, the patient when raised to the night-table, or even in bed, be seized with delirium, you may expect that the patient, man or woman, who experiences these symptoms, is about to fall into a state of delirium. Attention also should be paid to the hands, for if they tremble, you may expect epistaxis, and observe the nostrils, whether the breath be drawn in equally by both, and if expiration by the nostrils be large, a convulsion is apt to take place, and should a convulsion occur to such a person, death may be anticipated, and it is well to announce it beforehand.

10 If, in a winter fever, the tongue be rough, and if there be swoonings, it is likely to be the remission of the fever. Nevertheless such a person is to be kept upon a restricted diet, with water for drink, and hydromel, and the strained juices, not trusting to the remission of the fevers, as persons having these symptoms are in danger of dying, when, therefore, you perceive these symptoms, announce this prognostic, if you shall judge proper, after making the suitable observations. When, in fevers, any dangerous symptom appears on the fifth day, when watery discharges suddenly take place from the bowels, when delirium animi occurs, or the patient is attacked with loss of speech, convulsions, or hiccup, under such circumstances he is likely to be affected with nausea, and sweats break out under the nose and forehead, or on the back part of the neck and head, and patients with such symptoms shortly die, from stoppage of the respiration. When, in fevers, abscesses form about the legs, and, getting into a chronic state, are not concocted while the fever persists, and if one is seized with a sense of suffocation in the throat, while the fauces are not swelled, and if it do not come to maturation, but is repressed, in such a case there is apt to be a flow of blood from the nose, if this, then, be copious, it indicates a resolution of the disease, but if not, a prolongation of the complaint, and the less the discharge, so much worse the symptoms, and the more protracted the disease, but if the other symptoms are very favorable, expect in such a case that pains will fall upon the feet, if then they attack the feet, and if these continue long in a very painful, and inflamed state, and if there be no resolution, the pains will extend by degrees to the neck, to the clavicle, shoulder, breast, or to some articulation, in which an inflammatory tumor will necessarily form. When these are reduced, if the hands are contracted, and become trembling, convulsion and delirium seize such a person, but blisters break out on the eyebrow, erythema takes place, the one eyelid being tumefied overtops the other, a hard inflammation sets in, the eye become strongly swelled, and the delirium increases much, but makes its attacks rather at night than by day. These symptoms more frequently occur on odd than on even

days, but, whether on the one or the other, they are of a fatal character. Should you determine to give purgative medicines in such cases, at the commencement, you should do so before the fifth day, if there be borborygmi in the bowels, or, if not, you should omit the medicines altogether. If there be borborygmi, with bilious stools, purge moderately with scammony, but with regard to the treatment otherwise, administer as few drinks and draughts as possible, until there be some amendment, and the disease is past the fourteenth day. When loss of speech seizes a person, on the fourteenth day of a fever, there is not usually a speedy resolution, nor any removal of the disease, for this symptom indicates a protracted disease, and when it appears on that day, it will be still more prolonged. When, on the fourth day of a fever, the tongue articulates confusedly, and when there are watery and bilious discharges from the bowels, such a patient is apt to fall into a state of delirium, the physician ought, therefore, to watch him, and attend to whatever symptoms may turn up. In the season of summer and autumn an epistaxis, suddenly occurring in acute diseases, indicates vehemence of the attack, and inflammation in the course of the veins, and on the day following, the discharge of thin urine, and if the patient be in the prime of life, and if his body be strong from exercise, and brawny, or of a melancholic temperament, or if from drinking he has trembling hands, it may be well to announce beforehand either delirium or convulsion, and if these symptoms occur on even days, so much the better, but on critical days, they are of a deadly character. If, then, a copious discharge of blood procure an issue to the fullness thereof about the nose, or what is collected about the anus, there will be an abscess, or pains in the hypochondrium, or testicles, or in the limbs, and when these are resolved, there will be a discharge of thick sputa, and of smooth, thin urine. In fever attended with singultus, give *rasafoetida*, oxi-mel, and carrot, triturated together, in a draught, or galbanum in honey, and cumin in a linctus, or the juice of ptisan. Such a person cannot escape, unless critical sweats and gentle sleep supervene, and thick and acrid urine be passed, or the disease terminate in

an abcess give pine-fruit and myrrh in a linctus, and further give a very little oxymel to drink, but if they are very thirsty, some barley-water

II Peripneumonia, and pleuritic affections, are to be thus observed If the fever be acute, and if there be pains on either side, or in both, and if expiration be attended with pain, if cough be present, and the sputa expectorated be of a blond or livid color, or likewise thin, frothy, and florid, or having any other character different from the common, in such a case, the physician should proceed thus if the pain pass upward to the clavicle, or the breast, or the arm, the inner vein in the arm should be opened on the side affected, and blood abstracted according to the habit, age, and color of the patient, and the season of the year, and that largely and boldly, if the pain be acute, so as to bring on *deliquium animi*, and afterwards a clyster is to be given But if the pain be below the chest, and if very intense, purge the bowels gently in such an attack of pleurisy, and during the act of purging give nothing, but after the purging give oxymel The medicine is to be administered on the fourth day, on the first three days after the commencement, a clyster should be given, and if it does not relieve the patient, he should then be gently purged, but he is to be watched until the fever goes off, and till the seventh day, then if he appear to be free from danger, give him some unstrained ptisan, in small quantity, and thin at first, mixing it with honey If the expectoration be easy, and the breathing free, if his sides be free of pain, and if the fever be gone, he may take the ptisan thicker, and in larger quantity, twice a day But if he do not progress favorably, he must get less of the drink, and of the draught, which should be thin, and only given once a day, at whatever is judged to be the most favorable hour, this you will ascertain from the urine The draught is not to be given to persons after fever, until you see that the urine and sputa are concocted, (if, indeed, after the administration of the medicine he be purged frequently, it may be necessary to give it, but it should be given in smaller quantities and thinner than usual, for from inanition he will be unable to sleep, or digest properly, or wait the crisis,) but when the melting down of crude matters has

taken place, and his system has cast off what is offensive, there will then be no objection. The sputa are concocted when they resemble pus, and the urine when it has reddish sediments like tares. But there is nothing to prevent fomentations and cerries being applied for the other pains of the sides, and the legs and loins may be rubbed with hot oil, or anointed with fat, linseed too, in the form of a cataplasm, may be applied to the hypochondrium and as far up as the breasts. When pneumonia is at its height, the case is beyond remedy if he is not purged, and it is bad if he has dyspnœa, and urine that is thin and acrid, and if sweats come out about the neck and head, for such sweats are bad, as proceeding from the suffocation, *râles*, and the violence of the disease which is obtaining the upper hand, unless there be a copious evacuation of thick urine, and the sputa be concocted, when either of these come on spontaneously, that will carry off the disease. A linctus for pneumonia: Galbanum and pine-fruit in Attic honey, and southernwood in oxymel, make a decoction of pepper and black hellebore, and give it in cases of pleurisy attended with violent pain at the commencement. It is also a good thing to boil opoponax in oxymel, and, having strained it, to give it to drink, it answers well, also, in diseases of the liver, and in severe pains proceeding from the diaphragm, and in all cases in which it is beneficial to determine to the bowels or urinary organs, when given in wine and honey, when given to act upon the bowels, it should be drunk in larger quantity, along with a watery hydromel.

12 A dysentery, when stopped, will give rise to an aposteme, or tumor, if it do not terminate in fevers with sweats, or with thick and white urine, or in a tertian fever, or the pain fix upon the testicles, or on the hip-joints.

13 In a bilious fever, jaundice coming on with rigor before the seventh day carries off the fever, but if it occur without the fever, and not at the proper time, it is a fatal symptom.

14 When the loins are in a tetanic state, and the spirits in the veins are obstructed by melancholic humors, venesection will afford relief. But when, on the other hand, the anterior tendons are strongly contracted, and if there be sweats about the neck,

and face, extorted by the violent pain of the parched and dried tendons of the sacral extremity (these are very thick, sustaining the spine, and giving rise to very great ligaments, which terminate in the feet,) in such a case, unless fever and sleep come on, followed by concocted urine and critical sweats, give to drink a strong Cretan wine, and boiled barley-meal for food, anoint and rub with ointments containing wax, bathe the legs and feet in hot water, and then cover them up, and so in like manner the arms, as far as the hands, and the spine, from the neck to the sacrum, are to be wrapped in a skin smeared with wax, this must extend to the parts beyond, and intervals are to be left for applying fomentations, by means of leather bottles filled with hot water, then, wrapping him up in a linen cloth, lay him down in bed. Do not open the bowels, unless by means of a suppository, when they have been long of being moved. If there be any remission of the disease, so far well, but otherwise, pound of the root of bryonia in fragrant wine, and that of the carrot, and give to the patient fasting early in the morning, before using the affusion, and immediately afterwards let him eat boiled barley-meal in a tepid state, and as much as he can take, and in addition let him drink, if he will, wine well diluted. If the disease yield to these means, so much the better, but, if otherwise, you must prognosticate accordingly.

15 All diseases are resolved either by the mouth, the bowels, the bladder, or some other such organ. Sweat is a common form of resolution in all these cases.

16 You should put persons on a course of hellebore who are troubled with a defluxion from the head. But do not administer hellebore to such persons as are laboring under empyema connected with abscesses, hæmoptysis, and intemperament, or any other strong cause, for it will do no good, and if anything unpleasant occur the hellebore will get the blame of it. But if the body have suddenly lost its powers, or if there be pain in the head, or obstruction of the ears and nose, or ptialism, or heaviness of the limbs, or an extraordinary swelling of the body, you may administer the hellebore, provided these symptoms be not connected with drinking, nor with immoderate venery, nor with

sorrow, vexation, nor insomnolency, for, if any of these causes exist, the treatment must have respect to it

17. From walking arise pains of the sides, of the back, of the loins, and of the hip-joint, and disorder of the respiration has often been from the same cause, for, after excesses of wine and flatulent food, pains shoot to the loins and hips, accompanied with dysuria Walking is the cause of such complaints, and also of coryza and hoarseness

18 Disorders connected with regimen, for the most part, make their attack accordingly as any one has changed his habitual mode of diet For persons who dine contrary to custom experience much swelling of the stomach, drowsiness, and fullness, and if they take supper over and above, their belly is disordered, such persons will be benefited by sleeping after taking the bath, and by walking slowly for a considerable time after sleep, if, then, the bowels be moved, he may dine and drink a small quantity of wine not much diluted, but if the bowels are not opened, he should get his body rubbed with hot oil, and, if thirsty, drink of some weak and white wine, or a sweet wine, and take repose, if he does not sleep he should repose the longer In other respects he should observe the regimen laid down for those who have taken a debauch With regard to the bad effects of drinks, such as are of a watery nature pass more slowly through the body, they regurgitate, as it were, and float about the hypochondria, and do not flow readily by urine, when filled up with such a drink, he should not attempt any violent exertion, requiring either strength or swiftness, but should rest as much as possible until the drink has been digested along with the food, but such drinks as are stronger or more austere, occasion palpitation in the body and throbbing in the head, and in this case the person affected will do well to sleep, and take some hot draught for which he feels disposed, for abstinence is bad in headache and the effects of a surfeit Those who, contrary to usage, restrict themselves to one meal, feel empty and feeble, and pass hot urine in consequence of the emptiness of their vessels, they have a salt and bitter taste in the mouth, they tremble at any work they attempt, their temples throb, and they cannot digest their supper so well as if they had

previously taken their dinner. Such persons should take less supper than they are wont, and a pudding of barley-meal more moist than usual instead of bread, and of potherbs the dock, or mallow, and ptisan, or beets, and along with the food they should take wine in moderation, and diluted with water, after supper they should take a short walk, until the urine descend and be passed, and they may use boiled fish

Articles of food have generally such effects as the following
Garlic occasions flatulence and heat about the chest, heaviness of the head, and nausea, and any other habitual pain is apt to be exasperated by it, it is diuretic, which, in so far, is a good property which it possesses, but it is best to eat it when one means to drink to excess, or when intoxicated
Cheese produces flatulence and constipation, and heats the other articles of food, and it gives rise to crudities and indigestion, but it is worst of all to eat it along with drink after a full meal
Pulse of all kinds are flatulent, whether raw, boiled, or fried, least so when macerated in water, or in a green state, they should not be used except along with food prepared from the cerealia
Each of these articles, however, has bad effects peculiar to itself
The vetch, whether raw or boiled, creates flatulence and pain
The lentil is astringent, and disorders the stomach if taken with its hull
The lupine has the fewest bad effects of all these things
The stalk and the juice of silphium (*asafœtida*), pass through some people's bowels very readily, but in others, not accustomed to them, they engender what is called dry cholera, this complaint is more especially produced by it if mixed with much cheese, or eaten along with beef
Melancholic diseases are most particularly exacerbated by beef, for it is of an unmanageable nature, and requires no ordinary powers of stomach to digest it, it will agree best with those who use it well boiled and pretty long kept
Goat's flesh has all the bad properties of beef, it is an indigestible, more flatulent and engenders acid eructations and cholera, such as has a fragrant smell, is firm, and sweet to the taste, is the best, when well baked and cooled, but those kinds which are disagreeable to the taste, have a bad smell, and are hard, such are particularly bad, and especially if very fresh, it is best in summer and worst

in autumn The flesh of young pigs is bad, either when it is too raw or when it is over-roasted, for it engenders bile and disorders the bowels Of all kinds of flesh, pork is the best, it is best when neither very fat, nor, on the other hand, very lean, and the animal had not attained the age of what is reckoned an old victim, it should be eaten without the skin, and in a coldish state

19 In dry cholera the belly is distended with wind, there is rumbling in the bowels, pain in the sides and loins, no dejections, but, on the contrary, the bowels are constipated In such a case you should guard against vomiting, but endeavor to get the bowels opened. As quickly as possible give a clyster of hot water with plenty of oil in it, and having rubbed the patient freely with unguents, put him into hot water, laying him down in the basin, and pouring the hot water upon him by degrees, and if, when heated in the bath, the bowels be moved, he will be freed from the complaint To a person in such a complaint it will do good if he sleep, and drink a thin, old, and strong wine, and you should give him oil, so that he may settle, and have his bowels moved, when he will be relieved He must abstain from all other kinds of food, but when the pain remits, give him asses' milk to drink until he is purged But if the bowels are loose, with bilious discharges, tormina, vomitings, a feeling of suffocation, and gnawing pains, it is best to enjoin repose, and to drink hydromel, and avoid vomiting

20. There are two kinds of dropsy, the one anasarca, which, when formed, is incurable, the other is accompanied with emphysema (tympanites?) and requires much good fortune to enable one to triumph over it Laborious exertion, fomentation, and abstinence (are to be enjoined) The patient should eat dry and acrid things, for thus will he pass the more water, and his strength be kept up If he labors under difficulty of breathing, if it is the summer season, and if he is in the prime of life, and is strong, blood should be abstracted from the arm, and then he should eat hot pieces of bread, dipped in dark wine and oil, drink very little, and labor much, and live on well-fed pork, boiled with vinegar, so that he may be able to endure hard exercises

21 Those who have the inferior intestines hot, and who pass

acid and irregular stools of a colliquative nature, if they can bear it, should procure revulsion by vomiting with hellebore, but if not, should get a thick decoction of summer wheat in a cold state, lentil soup, bread cooked with cinders, and fish, which should be taken boiled if they have fever, but roasted if not feverish, and also dark-colored wine if free of fever, but otherwise they should take the water from medlars, myrtles, apples, services, dates, or wild vine. If there be no fever, and if there be tormina, the patient should drink hot asses' milk in small quantity at first, and gradually increase it, and linseed, and wheaten flour, and having removed the bitter part of Egyptian beans, and ground them, sprinkle on the milk and drink; and let him eat eggs half-roasted, and fine flour, and millet, and perl-spelt (*chondrus*) boiled in milk,—all these things should be eaten cold, and similar articles of food and drink should be administered.

22 The most important point of regimen to observe and be guarded about in protracted diseases, is to pay attention to the exacerbations and remissions of fevers, so as to avoid the times when food should not be given, and to know when it may be administered without danger, this last season is at the greatest possible distance from the exacerbation.

23 One should be able to recognize those who have headache from gymnastic exercises, or running, or walking or hunting, or any other unseasonable labor, or from immoderate venery, also those who are of a pale color, or troubled with hoarseness, those who have enlarged spleen, those who are in a state of *anæmia*, those who are suffering from tympanites, those having dry cough and thirst, those who are flatulent, and have the course of the blood in their veins intercepted, those persons whose hypochondria, sides, and back are distended, those having torpor; those laboring under amaurosis, or having noises in their ears, those suffering from incontinence of urine or jaundice, or whose food is passed undigested, those who have discharges of blood from the nose or anus, or who have flatulence and intense pain, and who cannot retain the wind. In these cases you may do mischief, but cannot possibly do any good by purging, but may interrupt the spontaneous remissions and crises of the complaints.

24 If you think it expedient to let blood, see that the bowels

be previously settled, and then bleed, enjoin abstinence, and forbid the use of wine, and complete the cure by means of a suitable regimen, and wet fomentations But if the bowels appear to be constipated, administer a soothing clyster

25 If you think it necessary to give medicines, you may safely purge upwards by hellebore, but none of those should be purged downwards The most effectual mode of treatment is by the urine, sweats, and exercise, and use gentle friction so as not to harden the constitution, and if he be confined to bed let others rub him When the pain is seated above the diaphragm, place him erect for the most part, and let him be as little reclined as possible, and when he is raised up let him be rubbed for a considerable time with plenty of hot oil But if the pains be in the lower belly below the diaphragm, it will be useful to lie reclined and make no motion, and to such a person nothing should be administered except the friction Those pains which are dissolved by discharges from the bowels, by urine, or moderate sweats, cease spontaneously, if they are slight, but if strong they prove troublesome, for persons so affected either die, or at least do not recover without further mischief, for they terminate in abscesses

26 *A draught for a diopsical person* Take three cantharides, and removing their head, feet, and wings, triturate their bodies in three cupfuls (cyathi) of water, and when the person who has drunk the draught complains of pain, let him have hot fomentations applied The patient should be first anointed with oil, should take the draught fasting, and eat hot bread with oil

27 *A styptic* Apply the juice of the fig inwardly to the vein, or having moulded biestings into a tent, introduce up the nostril, or push up some chalcitis with the finger, and press the cartilages of the nostrils together, and open the bowels with the boiled milk of asses or having shaved the head apply cold things to it if in the summer season

28 The sesamoides purges upwards when pounded in oxymel to the amount of a drachm and a half, and drunk, it is combined with the hellebores, to the amount of the third part, and thus it is less apt to produce suffocation

29 *Trichiasis* Having introduced a thread into the eye of a

needle push it through the upper part of the distended eyelid, and do the same at the base of it, having stretched the threads tie a knot on them, and bind up until they drop out and, if this be sufficient, so far well, but if otherwise, you must do the same thing again. And hemorrhoids, in like manner, you may treat by transfixing them with a needle and tying them with a very thick and large woolen thread, for thus the cure will be more certain. When you have secured them, use a septic application, and do not foment until they drop off, and always leave one behind, and when the patient recovers, let him be put upon a course of hellebore. Then let him be exercised and sweated, the friction of the gymnasium and wrestling in the morning will be proper, but he must abstain from running, drinking, and all acrid substances, except marjoram, let him take an emetic every seven days, or three times in a month, for thus will he enjoy the best bodily health. Let him take straw-colored, austere, and watery wine, and use little drink.

30 *For persons affected with empyema* Having cut some bulbs or squill, boil in water, and when well boiled, throw this away, and having poured in more water, boil until it appear to the touch soft and well-boiled, then triturate finely and mix roasted cumin, and white sesames, and young almonds pounded in honey, form into an electuary and give, and afterwards sweet wine. In draughts, having pounded about a small acetabulum of the white poppy, moisten it with water in which summer wheat has been washed, add honey, and boil. Let him take this frequently during the day. And then taking into account what are to happen, give him supper.

31 *For dysentery* A fourth part of a pound of cleaned beans, and twelve shoots of madder having been triturated, are to be mixed together and boiled, and given as a linctus with some fatty substance.

32 *For diseases of the eyes* Washed spodium (tutty?) mixed with grease, and not of a thinner consistence than dough, is to be carefully triturated, and moistened with the juice of unripe raisins, and having dried in the sun, moisten until it is of the consistence of an ointment. When it becomes again dry, let it

be finely levigated, anoint the eyes with it, and dust it upon the angles of the eyes

33 *For watery eyes* Take one drachm of ebeny and nine oboli of burnt copper, rub them upon a whetstone, add three oboli of saffron, triturate all these things reduced to a fine powder, pour in an Attic hemina of sweet wine, and then place in the sun and cover up, when sufficiently digested, use it

34 *For violent pains of the eyes* Take of chalcitis, and of raisin, of each 1 dr, when digested for two days, strain, and pounding myrrh and saffron, and having mixed must, with these things, digest in the sun, and with this anoint the eyes when in a state of severe pain Let it be kept in a copper vessel

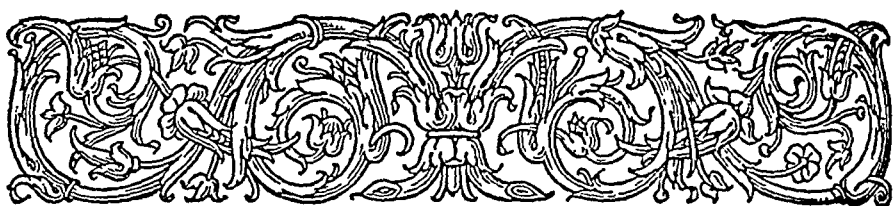
35 *Mode of distinguishing persons in an hysterical fit* Pinch them with your fingers, and if they feel, it is hysterical, but if not, it is a convulsion

36 *To persons in coma, (dropsy?)* give to drink meconium (*euphorbia peplus?*) to the amount of a round Attic *leciskion* (small acetabulum)

37 Of squama æris, as much as three specilla can contain, with the gluten of summer wheat levigate, pound, form into pills, and give, it purges water downwards

38 *A medicine for opening the bowels* Pour upon figs the juice of spurge, in the proportion of seven to one then put into a new vessel and lay past when properly mixed Give before food

39 Pounding meconium, pouring on it water, and straining, and mixing flour, and baking into a cake, with the addition of boiled honey, give in affections of the anus and in dropsy, and after eating of it, let the patient drink of a sweet watery wine, and diluted hydromel prepared from wax or collecting meconium, lay it up for medicinal purposes



Of the Epidemics

BOOK I

SEC I — CONSTITUTION FIRST

IN THASUS, about the autumnal equinox, and under the Pleiades, the rains were abundant, constant, and soft, with southerly winds, the winter southerly, the northerly winds faint, droughts, on the whole, the winter having the character of spring. The spring was southerly, cool, rains small in quantity. Summer, for the most part, cloudy, no rain, the Etesian winds, rare and small, blew in an irregular manner. The whole constitution of the season being thus inclined to the southerly, and with droughts early in the spring, from the preceding opposite and northerly state, ardent fevers occurred in a few instances, and these very mild, being rarely attended with hemorrhage, and never proving fatal. Swellings appeared about the ears, in many on either side, and in the greatest number on both sides, being unaccompanied by fever so as not to confine the patient to bed, in all cases they disappeared without giving trouble, neither did any of them come to suppuration, as is common in swellings from other causes. They were of a lax, large, diffused character, without inflammation or pain, and they went away without any critical sign. They seized children, adults, and mostly those who were engaged in the exercises of the palestra and gymnasium, but seldom attacked women. Many had dry coughs without expectoration, and accompanied with hoarseness of voice. In some instances earlier, and in others later, inflammations with pain seized sometimes one of

the testicles, and sometimes both, some of these cases were accompanied with fever and some not, the greater part of these were attended with much suffering. In other respects they were free of disease, so as not to require medical assistance.

2 Early in the beginning of spring, and through the summer, and towards winter, many of those who had been long gradually declining, took to bed with symptoms of phthisis, in many cases formerly of a doubtful character the disease then became confirmed, in these the constitution inclined to the phthisical. Many, and, in fact, the most of them, died, and of those confined to bed, I do not know if a single individual survived for any considerable time, they died more suddenly than is common in such cases. But other diseases, of a protracted character, and attended with fever, were well supported, and did not prove fatal of these we will give a description afterwards. Consumption was the most considerable of the diseases which then prevailed, and the only one which proved fatal to many persons. Most of them were affected by these diseases in the following manner: fevers accompanied with rigors, of the continual type, acute, having no complete intermissions, but of the form of the semi-tertians, being milder the one day, and the next having an exacerbation, and increasing in violence, constant sweats, but not diffused over the whole body, extremities very cold, and warmed with difficulty, bowels disordered, with bilious, scanty, unmixed, thin, pungent, and frequent dejections. The urine was thin, colorless, unconcocted, or thick, with a deficient sediment, not settling favorably, but casting down a crude and unseasonable sediment. Sputa small, dense, concocted, but brought up rarely and with difficulty, and in those who encountered the most violent symptoms there was no concoction at all, but they continued throughout spitting crude matters. Their fauces, in most of them, were painful from first to last, having redness with inflammation, defluxions thin, small and acrid, they were soon wasted and became worse, having no appetite for any kind of food throughout, no thirst, most persons delirious when near death. So much concerning the phthisical affections.

3 In the course of the summer and autumn many fevers of the

continual type, but not violent, they attacked persons who had been long indisposed, but who were otherwise not in an uncomfortable state. In most cases the bowels were disordered in a very moderate degree, and they did not suffer thereby in any manner worth mentioning, the urine was generally well colored, clear, thin, and after a time becoming concocted near the crisis. They had not much cough, nor was it troublesome, they were not deficient in appetite, for it was necessary to give them food, (on the whole, persons laboring under phthisis were not affected in the usual manner). They were affected with fevers, rigors, and deficient sweats, with varied and irregular paroxysms, in general not intermitting, but having exacerbations in the tertian form. The earliest crisis which occurred was about the twentieth day, in most about the fortieth, and in many about the eightieth. But there were cases in which it did not leave them thus at all, but in an irregular manner, and without any crisis, in most of these the fevers, after a brief interval, relapsed again, and from these relapses they came to a crisis in the same periods, but in many they were prolonged so that the disease was not gone at the approach of winter. Of all those which are described under this constitution, the phthisical diseases alone were of a fatal character, for in all the others the patients bore up well, and did not die of the other fevers.

SEC II — CONSTITUTION SECOND

1 In Thasus, early in autumn, the winter suddenly set in rainy before the usual time, with much northerly and southerly winds. These things all continued so during the season of the Pleiades, and until their setting. The winter was northerly, the rains frequent, in torrents, and large, with snow, but with a frequent mixture of fair weather. These things were all so, but the setting in of the cold was not much out of season. After the winter solstice, and at the time when the zephyr usually begins to blow, severe winterly storms out of season, with much northerly wind, snow, continued and copious rains, the sky tempestuous and clouded, these things were protracted, and did not remit until the equinox. The spring was cold, northerly, rainy, and clouded,

the summer was not very sultry, the Etesian winds blew constant, but quickly afterwards, about the rising of Arcturus, there were again many rains with north winds. The whole season being wet, cold, and northerly, people were, for the most part, healthy during winter, but early in the spring very many, indeed, the greater part, were valetudinary. At first ophthalmies set in, with rheums, pains, unconcocted discharges, small concretions, generally breaking with difficulty, in most instances they relapsed, and they did not cease until late in autumn. During summer and autumn there were dysenteric affections, attacks of tenesmus and hientery, bilious diarrhœa, with thin, copious, undigested, and acrid dejections, and sometimes with watery stools, many had copious defluxions, with pain, of a bilious, watery, slimy, purulent nature, attended with strangury, not connected with disease of the kidneys, but one complaint succeeding the other, vomitings of bile, phlegm, and undigested food, sweats, in all cases a redundancy of humors. In many instances these complaints were unattended with fever, and did not prevent the patients from walking about, but some cases were febrile, as will be described. In some all those described below occurred with pain. During autumn, and at the commencement of winter, there were phthisical complaints, continual fevers, and, in a few cases, ardent, some diurnal, others nocturnal, semitertians, true tertians, quartans, irregular fevers. All the fevers which are described attacked great numbers. The ardent fevers attacked the smallest numbers, and the patients suffered the least from them, for there were no hemorrhages, except a few and to a small amount, nor was there delirium, all the other complaints were slight, in these the crises were regular, in most instances, with the intermittents, in seventeen days, and I know no instance of a person dying of causus, nor becoming phrenitic. The tertians were more numerous than the ardent fevers, and attended with more pain, but these all had four periods in regular succession from the first attack, and they had a complete crisis in seven, without a relapse in any instance. The quartans attacked many at first, in the form of regular quartans, but in no few cases a transition from other fevers and diseases into quartans took place, they were

protracted, as is wont with them, indeed, more so than usual Quotidian, nocturnal, and wandering fevers attacked many persons, some of whom continued to keep up, and others were confined to bed In most instances these fevers were prolonged under the Pleiades and till winter Many persons, and more especially children, had convulsions from the commencement, and they had fever, and the convulsions supervened upon the fevers, in most cases they were protracted, but free from danger, unless in those who were in a deadly state from other complaints Those fevers which were continual in the main, and with no intermissions, but having exacerbations in the tertian form, there being remissions the one day and exacerbations the next, were the most violent of all those which occurred at that time, and the most protracted, and occurring with the greatest pains, beginning mildly, always on the whole increasing, and being exacerbated, and always turning worse, having small remissions, and after an abatement having more violent paroxysms, and growing worse, for the most part, on the critical days Rigors, in all cases, took place in an irregular and uncertain manner, very rare and weak in them, but greater in all other fevers, frequent sweats, but most seldom in them, bringing no alleviation, but, on the contrary, doing mischief Much cold of the extremities in them, and these were warmed with difficulty Insomnolency, for the most part, especially in these fevers, and again a disposition to coma The bowels, in all diseases, were disordered, and in a bad state, but worst of all in these The urine, in most of them, was either thin and crude, yellow, and after a time with slight symptoms of concoction in a critical form, or having the proper thickness, but muddy, and neither settling nor subsiding, or having small and bad, and crude sediments, these being the worst of all Coughs attended these fevers, but I cannot state that any harm or good ever resulted from the cough The most of these were protracted and troublesome, went on in a very disorderly and irregular form, and, for the most part, did not end in a crisis, either in the fatal cases or in the others, for if it left some of them for a season it soon returned again In a few instances the fever terminated with a crisis,

in the earliest of these about the eightieth day, and some of these relapsed, so that most of them were not free from the fever during the winter, but the fever left most of them without a crisis, and these things happened alike to those who recovered and to those who did not. There being much want of crisis and much variety as to these diseases, the greatest and worst symptom attended the most of them, namely, a loathing of all articles of food, more especially with those who had otherwise fatal symptoms, but they were not unseasonably thirsty in such fevers. After a length of time, with much suffering and great wasting, abscesses were formed in these cases, either unusually large, so that the patients could not support them, or unusually small, so that they did no good, but soon relapsed and speedily got worse. The diseases which attacked them were in the form of dysenteries, tenesmus, lientery, and fluxes, but, in some cases, there were dropsies, with or without these complaints. Whatever attacked them violently speedily cut them off, or again, did them no good. Small rashes, and not corresponding to the violence of the disease, and quickly disappearing, or swellings occurred about the ears, which were not resolved, and brought on no crisis. In some they were determined to the joints, and especially to the hip-joint, terminating critically with a few, and quickly again increasing to its original habit. Persons died of all these diseases, but mostly of these fevers, and especially infants just weaned, and and older children, until eight or ten years of age, and those before puberty. These things occurred to those affected with the complaints described above, and to many persons at first without them. The only favorable symptom, and the greatest of those which occurred, and what saved most of those who were in the greatest dangers, was the conversion of it to a strangury, and when, in addition to this, abscesses were formed. The strangury attacked, most especially, persons of the ages I have mentioned, but it also occurred in many others, both of those who were not confined to bed and those who were. There was a speedy and great change in all these cases. For the bowels, if they happened previously to have watery discharges of a bad character, became regular, they got an appetite for food, and the

fevers were mild afterwards But, with regard to the strangury itself, the symptoms were protracted and painful Their urine was copious, thick, of various characters, red, mixed with pus, and was passed with pain These all recovered, and I did not see a single instance of death among them

5. With regard to the dangers of these cases, one must always attend to the seasonable concoction of all the evacuations, and to the favorable and critical abscesses The concoctions indicate a speedy crisis and recovery of health, crude and undigested evacuations, and those which are converted into bad abscesses, indicate either want of crisis, or pains, or prolongation of the disease, or death, or relapses, which of these it is to be must be determined from other circumstances *The physician must be able to tell the antecedents, know the present, and foretell the future—must meditate these things, and have two special objects in view with regard to diseases, namely, to do good or to do no harm The art consists in three things—the disease, the patient, and the physician The physician is the servant of the art, and the patient must combat the disease along with the physician*¹

6 Pains about the head and neck, and heaviness of the same along with pain, occur either without fevers or in fevers Convulsions occurring in persons attacked with frenzy, and having vomitings of verdigris-green bile, in some cases quickly prove fatal In ardent fevers, and in those other fevers in which there is pain of the neck, heaviness of the temples, mistiness about the eyes, and distention about the hypochondriac region, not unattended with pain, hemorrhage from the nose takes place, but

¹ I need scarcely remark that this passage is of classical celebrity Galen, in his Commentary, remarks that the first time he read it he thought it unworthy of Hippocrates to lay it down as a rule of practice, that "the physician should do good to his patient, or at least no harm," but that, after having seen a good deal of the practice of other physicians, and observed how often they were justly exposed to censure for having bled, or applied the bath, or given medicines, or wine unseasonably, he came to recognize the propriety and importance of the rule laid down by Hippocrates The practice of certain physicians, Galen remarks, is like playing at the dice, when what turns up may occasion the greatest mischief to their patients The last clause of this passage is very forcibly put Galen, however, informs us that in some of the MSS instead of "art" he found "nature", that is to say, that the physician is "the minister (or servant) of nature" Either of the readings, he remarks, will agree very well with the meaning of the passage

those who have heaviness of the whole head, cardialgia and nausea, vomit bilious and pituitous matters, children, in such affections, are generally attacked with convulsions, and women have these and also pains of the uterus, whereas, in elder persons, and those in whom the heat is already more subdued, these cases end in paralysis, mania, and loss of sight

THIRD CONSTITUTION

7 In Thasus, a little before and during the season of Arcturus, there were frequent and great rains, with northerly winds About the equinox, and till the setting of the Pleiades, there were a few southerly rains the winter northerly and parched, cold, with great winds and snow Great storms about the equinox, the spring northerly, dryness, rains few and cold About the summer solstice, scanty rains, and great cold until near the season of the Dog-star After the Dog-days, until the season of Arcturus, the summer hot, great droughts, not in intervals, but continued and severe. no rain, the Etesian winds blew, about the season of Arcturus southerly rains until the equinox

8 In this state of things, during winter, paraplegia set in, and attacked many, and some died speedily, and otherwise the disease prevailed much in an epidemical form, but persons remained free from all other diseases Early in the spring, ardent fevers commenced and continued through the summer until the equinox Those then that were attacked immediately after the commencement of the spring and summer, for the most part recovered, and but few of them died But when the autumn and the rains had set in, they were of a fatal character, and the greater part then died When in these attacks of ardent fevers there was a proper and copious hemorrhage from the nose, they were generally saved by it, and I do not know a single person who had a proper hemorrhage who died in this constitution Philiscus, Epaminon, and Silenus, indeed, who had a trifling epistaxis on the fourth and fifth day, died The most of those seized with the disease had a rigor about the time of the crisis, and especially those who had no hemorrhage, these had also the rigor associated Some were attacked with jaundice on the sixth day, but these were benefited

Works of Hippocrates

either by an urinary purgation, or a disorder of the bowels, or a copious hemorrhage, as in the case of Heraclides, who was lodged with Aristocydes this person, though he had the hemorrhage from the nose, the purgation by the bladder, and disorder of the bowels, experienced a favorable crisis on the twentieth day, not like the servant of Phanagoras, who had none of these symptoms, and died. The hemorrhages attacked most persons, but especially young persons and those in the prime of life, and the greater part of those who had not the hemorrhage died. Elderly persons had jaundice or disorder of the bowels, such as Bion, who was lodged with Silenus. Dysenteries were epidemical during the summer, and some of those cases in which the hemorrhage occurred, terminated in dysentery, as happened to the slave of Eraton, and to Mullus, who had a copious hemorrhage, which settled down into dysentery, and they recovered. This humor was redundant in many cases, since in those who had not the hemorrhage about the crisis, but the risings about the ears disappeared, after their disappearance there was a sense of weight in the left flank extending to the extremity of the hip, and pain setting in after the crisis, with a discharge of thin urine, they began to have small hemorrhages about the twenty-fourth day, and the swelling was converted into the hemorrhage. In the case of Antiphon, the son of Critobulus, the fever ceased and came to a crisis about the fortieth day. Many women were attacked, but fewer than of the men, and there were fewer deaths among them. But most of them had difficult parturition, and after labor they were taken ill, and these most especially died, as, for example, the daughter of Telebolus died on the sixth day after delivery. Most females had the menstrual discharge during the fever, and many girls had it then for the first time in certain individuals both the hemorrhage from the nose and the menses appeared, thus, in the case of the virgin daughter of Dætharses, the menses then took place for the first time, and she had also a copious hemorrhage from the nose, and I knew no instance of any one dying when one or other of these took place properly. But all those in the pregnant state that were attacked had abortions, as far as I observed. The urine in most cases was of the proper color, but thin, and having scanty sediments in

most the bowels were disordered with thin and bilious dejections, and many, after passing through the other crises, terminated in dysenteries, as happened to Xenophanes and Critias. The urine was watery, copious, clear, and thin; and even after the crises, when the sediment was natural, and all the other critical symptoms were favorable, as I recollect having happened to Bion, who was lodged in the house of Silenus, and Critias, who lived with Xenophanes, the slave of Areton, and the wife of Mnesistratus. But afterwards all these were attacked with dysentery. It would be worth while to inquire whether the watery urine was the cause of this. About the season of Arcturus many had the crisis on the eleventh day, and in them the regular relapses did not take place, but they became comatose about this time, especially children, but there were fewest deaths of all among them.

9 About the equinox, and until the season of the Pleiades, and at the approach of winter, many ardent fevers set in, but great numbers at that season were seized with phrenitis, and many died, a few cases also occurred during the summer. These then made their attack at the commencement of ardent fevers, which were attended with fatal symptoms, for immediately upon their setting in, there were acute fever and small rigors, insomnolency, aberration, thirst, nausea, insignificant sweats about the forehead and clavicles, but no general perspiration, they had much delirious talking, fears, despondency, great coldness of the extremities, in the feet, but more especially in their hands. The paroxysms were on the even days, and in most cases, on the fourth day, the most violent pains set in, with sweats, generally coldish, and the extremities could not be warmed, but were livid and rather cold, and they had then no thirst, in them the urine was black, scanty, thin, and the bowels were constipated, there was an hemorrhage from the nose in no case in which these symptoms occurred, but merely a trifling epistaxis, and none of them had a relapse, but they died on the sixth day with sweats. In the phrenitic cases, all the symptoms which have been described did not occur, but in them the disease mostly came to a crisis on the eleventh day, and in some on the twentieth. In those cases in which the phrenitis did not begin immediately, but about the

third or fourth day, the disease was moderate at the commencement, but assumed a violent character about the seventh day. There was a great number of diseases, and of those affected, they who died were principally infants, young persons, adults having smooth bodies, white skins, straight and black hair, dark eyes, those living recklessly and luxuriously, persons with shrill, or rough voices, who stammered and were passionate, and women more especially died from this form. In this constitution, four symptoms in particular proved salutary, either a hemorrhage from the nose, or a copious discharge by the bladder of urine, having an abundant and proper sediment, or a bilious disorder of the bowels at the proper time, or an attack of dysentery. And in many cases it happened, that the crisis did not take place by any one of the symptoms which have been mentioned, but the patient passed through most of them, and appeared to be in an uncomfortable way, and yet all who were attacked with these symptoms recovered. All the symptoms which I have described occurred also to women and girls, and whoever of them had any of these symptoms in a favorable manner, or the menses appeared abundantly, were saved thereby, and had a crisis, so that I do not know a single female who had any of these favorably that died. But the daughter of Philo, who had a copious hemorrhage from the nose, and took supper unseasonably on the seventh day, died. In those cases of acute, and more especially of ardent fevers, in which there is an involuntary discharge of tears, you may expect a hemorrhage from the nose, unless the other symptoms be of a fatal character, for in those of a bad description, they do not indicate a hemorrhage, but death. Swellings about the ears, with pain in fevers, sometimes when the fever went off critically, neither subsided nor were converted into pus, in these cases a bilious diarrhœa, or dysentery, or thick urine having a sediment, carried off the disease, as happened to Hermippus of Clazomenæ. The circumstances relating to crises, as far as we can recognize them, were so far similar and so far dissimilar. Thus two brothers became ill at the same hour (they were brothers of Epigenes, and lodged near the theatre), of these the elder had a crisis on the sixth day, and the younger on the seventh,

Of the Epidemics

III

and both had a relapse at the same hour, it then left them for five days, and from the return of the fever both had a crisis together on the seventeenth day. Most had a crisis on the sixth day, it then left them for six days, and from the relapse there was a crisis on the fifth day. But those who had a crisis on the seventh day, had an intermission for seven days, and the crisis took place on the third day after the relapse. Those who had a crisis on the sixth day, after an interval of six days were seized again on the third, and having left them for one day, the fever attacked them again on the next and came to a crisis, as happened to Evagon the son of Dætharses. Those in whom the crisis happened on the sixth day, had an intermission of seven days, and from the relapse there was a crisis on the fourth, as happened to the daughter of Aglaïdas. The greater part of those who were taken ill under this constitution of things, were affected in this manner, and I did not know a single case of recovery, in which there was not a relapse agreeably to the stated order of relapses, and all those recovered in which the relapses took place according to this form nor did I know a single instance of those who then passed through the disease in this manner who had another relapse. In these diseases death generally happened on the sixth day, as happened to Epaminondas, Silenus, and Philiscus the son of Antagoras. Those who had parotid swellings experienced a crisis on the twentieth day, but in all these cases the disease went off without coming to a suppuration, and was turned upon the bladder. But in Cratistonax, who lived by the temple of Hercules, and in the maid servant of Scymnus the fuller, it turned to a suppuration, and they died. Those who had a crisis on the seventh day, had an intermission of nine days, and a relapse which came to a crisis on the fourth day from the return of the fever, as was the case with Pantacles, who resided close by the temple of Bacchus. Those who had a crisis on the seventh day, after an interval of six days had a relapse, from which they had a crisis on the seventh day, as happened to Phanocritus, who was lodged with Gnathon the painter. During the winter, about the winter solstices, and until the equinox, the ardent fevers and frenzies prevailed, and many died. The crisis, however, changed, and

Works of Hippocrates

happened to the greater number on the fifth day from the commencement, left them for four days and relapsed, and after the return, there was a crisis on the fifth day, making in all fourteen days. The crisis took place thus in the case of most children, also in elder persons. Some had a crisis on the eleventh day, a relapse on the fourteenth, a complete crisis on the twentieth, but certain persons, who had a rigor about the crisis in with a crisis on the fortieth. The greater part had a rigor along with the original crisis, and these had also a rigor about the crisis in the relapse. There were fewest cases of rigor in the spring, more in summer, still more in autumn, but by far the most in winter, then hemorrhages ceased.

SEC III

10 With regard to diseases, the circumstances from which we form a judgment of them are,—by attending to the general nature of all, and the peculiar nature of each individual,—to the disease, the patient, and the applications,—to the person who applies them, as that makes a difference for better or for worse,—to the whole constitution of the season, and particularly to the state of the heavens, and the nature of each country,—to the patient's habits, regimen, and pursuits,—to his conversation, manners, taciturnity, thoughts, sleep, or absence of sleep, and sometimes his dreams, what and when they occur,—to his picking and scratching,—to his tears,—to the alvine discharges, urine, sputa, and vomitings, and to the changes of diseases from the one into the other,—to the deposits, whether passed silently or character,—to the sweat, coldness, rigor, cough, sneezing, hiccup, respiration, eructation, flatulence, whether passed silently or with a noise,—to hemorrhages and hemorrhoids,—from these, and their consequences, we must form our judgment.

11 Fevers are,—the continual, some of which hold during the day and have a remission at night, and others hold during the night and have a remission during the day, semi-tertians, tertians, quartans, quintans, septans, nonans. The most acute, strongest, most dangerous, and fatal diseases, occur in the continual fever. The least dangerous of all, and the mildest and most protracted,

is the quartan, for it is not only such from itself, but it also carries off other great diseases. In what is called the semi-tertian, other acute diseases are apt to occur, and it is the most fatal of all others, and moreover phthisical persons, and those laboring under other protracted diseases, are apt to be attacked by it. The nocturnal fever is not very fatal, but protracted, the diurnal is still more protracted, and in some cases passes into phthisis. The septan is protracted, but not fatal, the nonan more protracted, and not fatal. The true tertian comes quickly to a crisis, and is not fatal, but the quintan is the worst of all, for it proves fatal when it precedes an attack of phthisis, and when it supervenes on persons who are already consumptive. There are peculiar modes, and constitutions, and paroxysms, in every one of these fevers, for example,—the continual, in some cases at the very commencement, grows, as it were, and attains its full strength, and rises to its most dangerous pitch, but is diminished about and at the crisis, in others it begins gentle and suppressed, but gains ground and is exacerbated every day, and bursts forth with all its heat about and at the crisis, while in others, again, it commences mildly, increases, and is exacerbated until it reaches its acmé, and then remits until at and about the crisis. These varieties occur in every fever, and in every disease. From these observations one must regulate the regimen accordingly. There are many other important symptoms allied to these, part of which have been already noticed, and part will be described afterwards, from a consideration of which one may judge, and decided in each case, whether the disease be acute, and whether it will end in death or recovery, or whether it will be protracted, and will end in death or recovery, and in what cases food is to be given, and in what not, and when and to what amount, and what particular kind of food is to be administered.

12 Those diseases which have their paroxysms on even days have their crises on even days, and those which have their paroxysms on uneven days have their crises on uneven days. The first period of those which have the crisis on even days, is the 4th, 6th, 8th, 10th, 14th, 20th, 30th, 40th, 60th, 80th, 100th, and the first period of those which have their crises on uneven

days, is the 1st, 3d, 5th, 7th, 9th, 11th, 17th, 21st, 27th, 31st. It should be known, that if the crisis take place on any other day than on those described, it indicates that there will be a relapse, which may prove fatal. But one ought to pay attention, and know in these seasons what crises will lead to recovery and what to death, or to changes for the better or the worse. Irregular fevers, quartans, quintans, septans, and nonans should be studied, in order to find out in what periods their crises take place.

13 FOURTEEN CASES OF DISEASE

CASE I — Philiscus, who lived by the Wall, took to bed on the first day of acute fever, he sweated, towards night was uneasy. On the second day all the symptoms were exacerbated, late in the evening had a proper stool from a small clyster, the night quiet. On the third day, early in the morning and until noon, he appeared to be free from fever, towards evening, acute fever, with sweating, thirst, tongue parched, passed black urine, night uncomfortable, no sleep, he was delirious on all subjects. On the fourth, all the symptoms exacerbated, urine black, night more comfortable, urine of a better color. On the fifth, about mid-day, had a slight trickling of pure blood from the nose, urine varied in character, having floating in it round bodies, resembling semen, and scattered, but which did not fall to the bottom, a suppository having been applied, some scanty flatulent matters were passed, night uncomfortable, little sleep, talking incoherently, extremities altogether cold, and could not be warmed, urine black, slept a little towards day, loss of speech, cold sweats, extremities livid, about the middle of the sixth day he died. The respiration throughout, like that of a person recollecting himself, was rare, and large, and spleen was swelled upon in a round tumor, the sweats cold throughout, the paroxysms on the even days.

CASE II — Silenus lived on the Broad-way, near the house of Evalcidas. From fatigue, drinking, and unseasonable exercises, he was seized with fever. He began with having pain in the loins, he had heaviness of the head, and there was stiffness of the neck. On the first day the alvine discharges were bilious, unmixed,

frothy, high colored, and copious, urine black, having a black sediment, he was thirsty, tongue dry, no sleep at night On the second, acute fever, stools more copious, thinner, frothy, urine black, an uncomfortable night, slight delirium On the third, all the symptoms exacerbated, an oblong distention, of a softish nature, from both sides of the hypochondrium to the navel, stools thin, and darkish, urine muddy, and darkish, no sleep at night, much talking, laughter, singing, he could not restrain himself On the fourth, in the same state On the fifth, stools bilious, unmixed, smooth, greasy, urine thin, and transparent, slight absence of delirium On the sixth, slight perspiration about the head, extremities cold and livid, much tossing about, no passage from the bowels, urine suppressed, acute fever On the seventh, loss of speech, extremities could no longer be kept warm, no discharge of urine On the eighth, a cold sweat all over, red rashes with sweat, of a round figure, small, like *vari*, persistent, not subsiding, by means of a slight stimulus, a copious discharge from the bowels, of a thin and undigested character, with pain, urine acrid, and passed with pain, extremities slightly heated, sleep slight, and comatose, speechless, urine thin, and transparent On the ninth, in the same state On the tenth, no drink taken, comatose, sleep slight, alvine discharges the same, urine abundant, and thickish, when allowed to stand, the sediment farinaceous and white, extremities again cold On the eleventh, he died At the commencement, and throughout, the respiration was slow and large, there was a constant throbbing in the hypochondrium, his age was about twenty

CASE III —Herophon was seized with an acute fever, alvine discharges at first were scanty, and attended with tenesmus, but afterwards they were passed of a thin, bilious character, and frequent, there was no sleep, urine black, and thin On the fifth, in the morning, deafness, all the symptoms exacerbated, spleen swollen, distention of the hypochondrium, alvine discharges scanty, and black, he became delirious On the sixth, delirious, at night, sweating, coldness, the delirium continued On the seventh, he became cold, thirsty, was disordered in mind, at night recovered his senses, slept On the eighth, was feverish,

the spleen diminished in size, quite collected, had pain at first about the groin, on the same side as the spleen, had pains in both legs, night comfortable, urine better colored, had a scanty sediment. On the ninth, sweated, the crisis took place, fever remitted. On the fifth day afterwards, fever relapsed, spleen immediately became swollen, acute fever, deafness again. On the third day after the relapse, the spleen diminished, deafness less, legs painful, sweated during the night, crisis took place on the seventeenth day, had no disorder of the senses during the relapse.

CASE IV — In Thasus, the wife of Philinus, having been delivered of a daughter, the lochial discharge being natural, and other matters going on mildly, on the fourteenth day after delivery was seized with fever, attended with rigor, was pained at first in the cardiac region of the stomach and right hypochondrium, pain in the genital organs, lochial discharge ceased. Upon the application of a pessary all these symptoms were alleviated, pains of the head, neck, and loins remained, no sleep, extremities cold, thirst, bowels in a hot state, stools scanty, urine thin, and colorless at first. On the sixth, towards night, senses much disordered, but again were restored. On the seventh, thirsty, the evacuations bilious, and high colored. On the eighth, had a rigor, acute fever, much spasm, with pain, talked much, incoherently, upon the application of a suppository, rose to stool, and passed copious dejections, with a bilious flux, no sleep. On the ninth, spasms. On the tenth, slightly recollected. On the eleventh, slept, had perfect recollection, but again immediately wandered, passed a large quantity of urine with spasms, (the attendants seldom putting her in mind,) it was thick, white, like urine which has been shaken after it has stood for a considerable time until it has subsided, but it had no sediment, in color and consistence, the urine resembled that of cattle, as far as I observed. About the fourteenth day, startings over the whole body, talked much, slightly collected, but presently became again delirious. About the seventeenth day became speechless, on the twentieth died.

CASE V — The wife of Epicrates, who was lodged at the house

Of the Epidemics

117

of Archigetes, being near the term of delivery, was seized with a violent rigor, and, as was said, she did not become heated, next day the same. On the third, she was delivered of a daughter, and everything went on properly. On the day following her delivery, she was seized with acute fever, pain in the cardiac region of the stomach, and in the genital parts. Having had a suppository, was in so far relieved, pain in the head, neck, and loins, no sleep, alvine discharges scanty, bilious, thin, and unmixed, urine thin, and blackish. Towards the night of the sixth day from the time she was seized with the fever, became delirious. On the seventh, all the symptoms exacerbated, insomnolency, delirium, thirst, stools bilious, and high colored. On the eighth, had a rigor, slept more. On the ninth, the same. On the tenth, her limbs painfully affected, pain again of the cardiac region of the stomach, heaviness of the head, no delirium, slept more, bowels constipated. On the eleventh, passed urine of a better color, and having an abundant sediment, felt lighter. On the fourteenth had a rigor, acute fever. On the fifteenth, had a copious vomiting of bilious and yellow matters, sweated, fever gone, at night acute fever, urine thick, sediment white. On the seventeenth, an exacerbation, night uncomfortable, no sleep, delirium. On the eighteenth, thirsty, tongue parched, no sleep, much delirium, legs painfully affected. About the twentieth, in the morning, had a slight rigor; was comatose, slept tranquilly, had slight vomiting of bilious and black matters, towards night deafness. About the twenty-first, weight generally in the left side, with pain, slight cough, urine thick, muddy, and reddish, when allowed to stand, had no sediment, in other respects felt lighter, fever not gone, fauces painful from the commencement, and red, uvula retracted, defluxion remained acrid, pungent, and saltish throughout. About the twenty-seventh, free of fever, sediment in the urine, pain in the side. About the thirty-first, was attacked with fever, bilious diarrhœa, slight bilious vomiting on the fortieth. Had a complete crisis, and was freed from the fever on the eightieth day.

CASE VI — Cleonactides, who was lodged above the Temple of Hercules, was seized with a fever in an irregular form, was pained

in the head and left side from the commencement, and had other pains resembling those produced by fatigue, paroxysms of the fevers inconstant and irregular, occasional sweats, the paroxysms generally attacked on the critical days About the twenty-fourth was cold in the extremities of the hands, vomitings bilious, yellow, and frequent, soon turning to a verdigris-green color, general relief About the thirtieth, began to have hemorrhage from both nostrils, and this continued in an irregular manner until near the crisis, did not loathe food, and had no thirst throughout, nor was troubled with insomnolency, urine thin, and not devoid of color When about the thirtieth day, passed reddish urine, having a copious red sediment, was relieved, but afterwards the characters of the urine varied, sometimes having sediment, and sometimes not On the sixtieth, the sediment in the urine copious, white, and smooth, all the symptoms ameliorated, intermission of the fever, urine thin, and well colored On the seventieth, fever gone for ten days On the eightieth had a rigor, was seized with acute fever, sweated much, a red, smooth sediment in the urine, and a perfect crisis

CASE VII —Meton was seized with fever, there was a painful weight in the loins Next day, after drinking water pretty copiously, had proper evacuations from the bowels On the third, heaviness of the head, stools thin, bilious, and reddish On the fourth, all the symptoms exacerbated, had twice a scanty trickling of blood from the right nostril, passed an uncomfortable night, alvine discharges like those on the third day, urine darkish, had a darkish cloud floating in it, of a scattered form, which did not subside On the fifth, a copious hemorrhage of pure blood from the left nostril, he sweated, and had a crisis After the fever restless, and had some delirium, urine thin, and darkish, had an affusion of warm water on the head, slept and recovered his senses In this case there was no relapse, but there were frequent hemorrhages after the crisis

CASE VIII —Erasinus, who lived near the Canal of Bootes, was seized with fever after supper, passed the night in an agitated state During the first day quiet, but in pain at night On the second, symptoms all exacerbated, at night delirious On the

third, was in a painful condition, great incoherence On the fourth, in a most uncomfortable state, had no sound sleep at night, but dreaming and talking, then all the appearances worse, of a formidable and alarming character, fear, impatience On the morning of the fifth, was composed, and quite coherent, but long before noon was furiously mad, so that he could not constrain himself, extremities cold, and somewhat livid, urine without sediment, died about sunset The fever in this case was accompanied by sweats throughout, the hypochondria were in a state of meteorism, with distention and pain, the urine was black, had round substances floating in it, which did not subside, the alvine evacuations were not stopped, thirst throughout not great, much spasms with sweats about the time of death

CASE IX — Criton, in Thasus, while still on foot, and going about, was seized with a violent pain in the great toe, he took to bed the same day, had rigors and nausea, recovered his heat slightly, at night was delirious On the second, swelling of the whole foot, and about the ankle erythema, with distention, and small bullæ (phlyctænæ), acute fever, he became furiously deranged, alvine discharges bilious, unmixed, and rather frequent He died on the second day from the commencement

CASE X — The Clazomenian who was lodged by the Well of Phrynichides was seized with fever He had pain in the head, neck, and loins from the beginning, and immediately afterwards deafness, no sleep, acute fever, hypochondria elevated with a swelling, but not much distention, tongue dry On the fourth, towards night, he became delirious On the fifth, in an uneasy state On the sixth, all the symptoms exacerbated About the eleventh a slight remission, from the commencement to the fourteenth day the alvine discharges thin, copious, and of the color of water, but were well supported, the bowels then became constipated Urine throughout thin, and well colored, and had many substances scattered through it, but no sediment About the sixteenth, urine somewhat thicker, which had a slight sediment, somewhat better, and more collected On the seventeenth, urine again thin, swellings about both his ears, with pain, no sleep, some incoherence, legs painfully affected On the twentieth,

eth, free of fever, had a crisis, no sweat, perfectly collected About the twenty-seventh, violent pain of the right hip, it speedily went off The swellings about the ears subsided, and did not suppurate, but were painful About the thirty-first, a diarrhœa, attended with a copious discharge of watery matter, and symptoms of dysentery, passed thick urine, swellings about the ears gone About the fortieth day, had pain in the right eye, sight dull It went away

CASE XI.—The wife of Dromeades having been delivered of a female child, and all other matters going on properly, on the second day after was seized with rigor and acute fever Began to have pain about the hypochondrium on the first day, had nausea and incoherence, and for some hours afterwards had no sleep, respiration rare, large, and suddenly interrupted On the day following that on which she had the rigor, alvine discharges proper, urine thick, white, muddy, like urine which has been shaken after standing for some time, until the sediment had fallen to the bottom, it had no sediment, she did not sleep during the night On the third day, about noon, had a rigor, acute fever, urine the same, pain of the hypochondria, nausea, an uncomfortable night, no sleep, a coldish sweat all over, but heat quickly restored On the fourth, slight allevation of the symptoms about the hypochondria, heaviness of the head, with pain, somewhat comatose, slight epistaxis, tongue dry, thirst, urine thin and oily, slept a little, upon awaking was somewhat comatose, slight coldness, slept during the night, was delirious On the morning of the sixth had a rigor, but soon recovered her heat, sweated all over, extremities cold, was delirious, respiration rare and large Shortly afterwards spasms from the head began, and she immediately expired

CASE XII —A man, in a heated state, took supper, and drank more than enough, he vomited the whole during the night, acute fever, pain of the right hypochondrium, a softish inflammation from the inner part, passed an uncomfortable night, urine at the commencement thick, red, but when allowed to stand, had no sediment, tongue dry, and not very thirsty On the fourth, acute fever, pains all over On the fifth, urine smooth, oily, and

Of the Epidemics

I 2 I

copious; acute fever On the sixth, in the evening, very incoherent, no sleep during the night On the seventh, all the symptoms exacerbated, urine of the same characters, much talking, and he could not contain himself, the bowels being stimulated, passed a watery discharge with lumbrici night equally painful In the morning had a rigor, acute fever, hot sweat, appeared to be free of fever, did not sleep long, after the sleep a chill, ptyalism, in the evening, great incoherence, after a little, vomited a small quantity of dark bilious matters On the ninth, coldness, much delirium, did not sleep On the tenth, pains in the limbs, all the symptoms exacerbated, he was delirious On the eleventh, he died.

CASE XIII —A woman, who lodged on the Quay, being three months gone with child, was seized with fever, and immediately began to have pains in the loins On the third day, pain of the head and neck, extending to the clavicle, and right hand, she immediately lost the power of speech, was paralyzed in the right hand, with spasms, after the manner of paraplegia, was quite incoherent, passed an uncomfortable night, did not sleep, disorder of the bowels, attended with bilious, unmixed, and scanty stools On the fourth, recovered the use of her tongue, spasms of the same parts, and general pains remained, swelling in the hypochondrium, accompanied with pain, did not sleep, was quite incoherent, bowels disordered, urine thin, and not of a good color On the fifth, acute fever, pain of the hypochondrium, quite incoherent, alvine evacuations bilious, towards night had a sweat, and was freed from the fever On the sixth, recovered her reason, was every way relieved, the pain remained about the left clavicle, was thirsty, urine thin, had no sleep On the seventh trembling, slight coma, some incoherence, pains about the clavicle and left arm remained, in all other respects was alleviated, quite coherent. For three days remained free from fever On the eleventh, had a relapse, with rigor and fever About the fourteenth day, vomited pretty abundantly bilious and yellow matters, had a sweat, the fever went off, by coming to a crisis

CASE XIV —Melidia, who lodged near the Temple of Juno, began to feel a violent pain of the head, neck, and chest She

was straightway seized with acute fever, a slight appearance of the menses, continued pains of all these parts. On the sixth, was affected with coma, nausea, and rigor, redness about the cheeks, slight delirium. On the seventh, had a sweat, the fever intermitted, the pains remained. A relapse, little sleep, urine throughout of a good color, but thin, the alvine evacuations were thin, bilious, acrid, very scanty, black, and fetid, a white, smooth sediment in the urine, had a sweat, and experienced a perfect crisis on the eleventh day.

BOOK III

SEC I

CASE I—Pythion, who lived by the Temple of the Earth, on the first day, trembling commencing from his hands, acute fever, delirium. On the second, all the symptoms were exacerbated. On the third, the same. On the fourth alvine discharges scanty, unmixed, and bilious. On the fifth, all the symptoms were exacerbated, the tremors remained, little sleep, the bowels constipated. On the sixth sputa mixed, reddish. On the seventh, mouth drawn aside. On the eighth, all the symptoms were exacerbated, the tremblings were again constant, urine, from the beginning to the eighth day, thin, and devoid of color, substances floating in it, cloudy. On the tenth he sweated, sputa somewhat digested, had a crisis, urine thinnish about the crisis, but after the crisis, on the fortieth day, an abscess about the anus, which passed off by a strangury.

Explanation of the characters. It is probably that the great discharge of urine brought about the resolution of the disease, and the cure of the patient on the fortieth day.

CASE II—Hermocrates, who lived by the New Wall, was seized with fever. He began to have pain in the head and loins, an empty distention of the hypochondrium, the tongue at first was parched, deafness at the commencement, there was no sleep, not very thirsty, urine thick and red, when allowed to stand it did not subside, alvine discharge very dry, and not scanty. On the fifth, urine thin, had substances floating in it.

which did not fall to the bottom, at night he was delirious. On the sixth, had jaundice, all the symptoms were exacerbated, had no recollection. On the seventh, in an uncomfortable state, urine thin, as formerly, on the following days the same. About the eleventh day, all the symptoms appeared to be lightened. Coma set in, urine thicker, reddish, thin substances below, had no sediment, by degrees he became collected. On the fourteenth, fever gone, had no sweat, slept, quite collected, urine of the same characters. About the seventeenth, had a relapse, became hot. On the following days, acute fever, urine thin, was delirious. Again, on the twentieth, had a crisis, free of fever, had no sweat, no appetite through the whole time, was perfectly collected, could not speak, tongue dry, without thirst, deep sleep. About the twenty-fourth day he became heated, bowels loose, with a thin, watery discharge, on the following days acute fever, tongue parched. On the twenty-seventh he died. In this patient deafness continued throughout, the urine either thick and red, without sediment, or thin, devoid of color, and, having substances floating in it he could taste nothing.

Explanation of the characters It is probably that it was the suppression of the discharges from the bowels which occasioned death on the twenty-seventh day.

CASE III —The man who was lodged in the Garden of Dealces had heaviness of the head and pain in the right temple for a considerable time, from some accidental cause, was seized with fever, and took to bed. On the second, there was a trickling of pure blood from the left nostril, but the alvine discharges were proper, urine thin, mixed, having small substances floating in it, like coarse barley meal, or semen. On the third, acute fever, stools black, thin, frothy, a livid sediment in the dejections, slight coma, uneasiness at the times he had to get up, sediment in the urine livid, and somewhat viscid. On the fourth, slight vomiting of bilious, yellow matters, and, after a short interval, of the color of verdigris, a few drops of pure blood ran from the left nostril, stools the same, urine the same, sweated about the head and clavicles, spleen enlarged, pain of the thigh on the same side, loose swelling of the right hypochondrium, at night

had no sleep, slight delirium On the sixth, stools black, fatty, viscid, fetid, slept, more collected On the seventh, tongue dry, thirsty, did not sleep, was somewhat delirious, urine thin, not of a good color On the eighth, stools black, scanty, and compact, slept, became collected, not very thirsty On the ninth had a rigor, acute fever, sweated, a chill, was delirious, strabismus of the right eye, tongue dry, thirsty, without sleep On the tenth, much the same On the eleventh, became quite collected, free from fever, slept, urine thin about the crisis The two following days without fever, it returned on the fourteenth, then immediately insomnolency and complete delirium On the fifteenth, urine muddy, like that which has been shaken after the sediment has fallen to the bottom, acute fever, quite delirious, did not sleep, knees and legs painful, after a suppository, had alvine dejections of a black color On the sixteenth, urine thin, had a cloudy eneorema, was delirious On the seventeenth, in the morning, extremities cold, was covered up with the bed-clothes, acute fever, general sweat, felt relieved, more collected, not free of fever, thirsty, vomited yellow bile, in small quantities, formed fæces passed from the bowels, but soon afterwards black, scanty, and thin, urine thin, not well colored On the eighteenth, not collected, comatose On the nineteenth, in the same state. On the twentieth, slept, quite collected, sweated, free from fever, not thirsty, but the urine thin On the twenty-first, slight delirium, somewhat thirsty, pain of the hypochondrium, and throbbing about the navel throughout On the twenty-fourth, sediment in the urine, quite collected Twenty-seventh, pain of the right hip joint, urine thin and bad, a sediment, all the other symptoms milder About the twenty-ninth, pain of the right eye, urine thin Fortieth, dejections pituitous, white, rather frequent, sweated abundantly all over, had a complete crisis

Explanation of the characters It is probable that, by means of the stools, the urine, and the sweat, this patient was cured in forty days

SEC II

CASE IV—In Thasus, Philistes had headache of long continuance, and sometimes was confined to bed, with a tendency

to deep sleep, having been seized with continual fevers from drinking, the pain was exacerbated, during the night he, at first, became hot On the first day, he vomited some bilious matters, at first yellow, but afterwards of a verdigris-green color, and in greater quantity, formed fæces passed from the bowels, passed the night uncomfortably On the second, deafness, acute fever, retraction of the right hypochondrium, urine thin, transparent, had some small substances like semen floating in it, delirium ferox about mid-day On the third, in an uncomfortable state On the fourth, convulsions, all the symptoms exacerbated On the fifth, early in the morning, died

Explanation of the characters It is probable that the death of the patient on the fifth day is to be attributed to a phrenitis, with unfavorable evacuations

CASE V —Charion, who was lodged at the house of Demænetus, contracted a fever from drinking Immediately he had a painful heaviness of the head, did not sleep, bowels disordered, with thin and somewhat bilious discharges On the third day, acute fever, trembling of the head, but especially of the lower lip, after a little time a rigor, convulsions, he was quite delirious, passed the night uncomfortably On the fourth, quiet, slept little, talked incoherently On the fifth, in pain, all the symptoms exacerbated, delirium, passed the night uncomfortably, did not sleep On the sixth, in the same state On the seventh had a rigor, acute fever, sweated all over his body, had a crisis Throughout the alvine discharges were bilious, scanty, and unmixed, urine thin, well colored, having cloudy substances floating in it About the eighth day, passed urine of a better color, having a white scanty sediment, was collected, free from fever for a season On the ninth it relapsed About the fourteenth, acute fever On the sixteenth, vomited pretty frequently yellow, bilious matters On the seventeenth had a rigor, acute fever, sweated, free of fever, had a crisis, urine, after the relapse and the crisis, well colored, having a sediment, neither was he delirious in the relapse On the eighteenth, became a little heated, some thirst, urine thin, with cloudy substances floating in it, slight wandering in his mind About the nineteenth, free of fever, had

a pain in his neck, a sediment in the urine Had a complete crisis on the twentieth

Explanation of the characters It is probable that the patient was cured in twenty days, by the abundance of bilious stools and urine

CASE VI—The daughter of Euryanax, a maid, was taken ill of fever She was free of thirst throughout, but had no relish for food Alvine discharges small, urine thin, scanty, not well colored In the beginning of the fever, had a pain about the nates On the sixth day, was free of fever, did not sweat, had a crisis, the complaint about the nates came to a small suppuration, and burst at the crisis After the crisis, on the seventh day, had a rigor, became slightly heated, sweated. On the eighth day after the rigor, had an inconsiderable rigor, the extremities cold ever after About the tenth day, after a sweat which came on, she became delirious, and again immediately afterwards was collected, these symptoms were said to have been brought on by eating grapes After an intermission of the twelfth day, she again talked much incoherently, her bowels disordered with bilious, scanty, unmixed, thin, acrid discharges, she required to get frequently up. She died on the seventh day after the return of the delirium At the commencement of the disease she had pain in the throat, and it was red throughout, uvula retracted, defluxions abundant, thin, acrid, coughed, but had no concocted sputa, during the whole time loathed all kinds of food, nor had the least desire of anything, had no thirst, nor drank anything worth mentioning, was silent, and never spoke a word, despondency, had no hopes of herself She had a congenital tendency to phthisis

CASE VII—The woman affected with quinsy, who lodged in the house of Aristion her complaint began in the tongue, speech inarticulate, tongue red and parched On the first day, felt chilly, and afterwards became heated On the third day, a rigor, acute fever, a reddish and hard swelling on both sides of the neck and chest, extremities cold and livid, respiration elevated, the drink returned by the nose, she could not swallow, alvine and urinary discharges suppressed On the fourth, all of the symptoms were exacerbated On the sixth she died of the quinsy

Explanation of the characters It is probable that the cause of death on the sixth day was the suppression of the discharges

CASE VIII —The young man who was lodged by the Liars' Market was seized with fever from fatigue, labor, and running out of season On the first day, the bowels disordered, with bilious, thin, and copious dejections, urine thin and blackish, had no sleep, was thirsty On the second all the symptoms were exacerbated, dejections more copious and unseasonable, he had no sleep, disorder of the intellect, slight sweat On the third day, restless, thirst, nausea, much tossing about, bewilderment, delirium, extremities livid and cold, softish distention of the hypochondrium on both sides On the fourth, did not sleep, still worse On the seventh he died He was about twenty years of age

Explanation of the characters It is probable that the cause of his death on the seventh day was the unseasonable practices mentioned above An acute affection

CASE IX —The woman who lodged at the house of Tisamenas had a troublesome attack of iliac passion, much vomiting, could not keep her drink, pains about the hypochondria, and pains also in the lower part of the belly, constant tormina, not thirsty, became hot, extremities cold throughout, with nausea and insomnolency, urine scanty and thin, dejections undigested, thin, scanty Nothing could do her any good She died

CASE X —A woman of those who lodged with Pantimides, from a miscarriage, was taken ill of fever On the first day, tongue dry, thirst, nausea, insomnolency, belly disordered, with thin, copious, undigested dejections On the second day, had a rigor, acute fever, alvine discharges copious, had no sleep On the third, pains greater On the fourth, delirious On the seventh she died Belly throughout loose, with copious, thin, undigested evacuations, urine scanty, thin An ardent fever

CASE XI —Another woman, after a miscarriage about the fifth month, the wife of Ocetes, was seized with fever At first had sometimes coma and sometimes insomnolency, pain of the loins, heaviness of the head On the second, the bowels were disordered, with scanty, thin, and at first unmixed dejections On the third, more copious, and worse, at night did not sleep On

the fourth was delirious, frights, despondency, strabismus of the right eye, a faint cold sweat about the head, extremities cold. On the fifth day, all the symptoms were exacerbated, talked much incoherently, and again immediately became collected; had no thirst, labored under insomnolency, alvine dejections copious, and unseasonable throughout, urine scanty, thin, darkish, extremities cold, somewhat livid. On the sixth day, in the same state. On the seventh she died. Phrenitis

CASE XII—A woman who lodged near the Liars' Market, having then brought forth a son in a first and difficult labor, was seized with fever. Immediately on the commencement had thirst, nausea, and cardialgia, tongue dry, bowels disordered, with thin and scanty dejections; had no sleep. On the second, had slight rigor, acute fever, a faint cold sweat about the head. On the third, painfully affected, evacuations from the bowels undigested, thin, and copious. On the fourth, had a rigor, all the symptoms exacerbated, insomnolency. On the fifth, in a painful state. On the sixth, in the same state, discharges from the bowels liquid and copious. On the seventh, had a rigor, fever acute, much thirst, much tossing about, towards evening a cold sweat over all, extremities cold, could no longer be kept warm, and again at night had a rigor, extremities could not be warmed, she did not sleep, was slightly delirious, and again speedily collected. On the eighth, about mid-day, she became warm, was thirsty, comatose, had nausea, vomited small quantities of yellowish bile, restless at night, did not sleep, passed frequently large quantities of urine without consciousness. On the ninth, all the symptoms gave way, comatose, towards evening slight rigors, small vomitings of bile. On the tenth, rigor, exacerbation of the fever, did not sleep at all, in the morning passed much urine having a sediment, extremities recovered their heat. On the eleventh, vomited bile of a verdigris-green color; not long after had a rigor, and again the extremities cold, towards evening a rigor, a cold sweat, much vomiting, passed a painful night. On the twelfth, had copious black and fetid vomitings, much hiccup, painful thirst. On the thirteenth, vomitings black, fetid, and copious, rigor about mid-day, loss of speech. On the four-

teenth, some blood ran from her nose, she died In this case the bowels were loose throughout, with rigors her age about seventeen An ardent fever

SECTION III — CONSTITUTION 2

The year was southerly, rainy, no winds throughout Droughts having prevailed during the previous seasons of the year, the south winds towards the rising of Arcturus were attended with much rain. Autumn gloomy and cloudy, with copious rains Winter southerly, damp, and soft But long after the solstice, and near the equinox, much wintery weather out of season, and when now close to the equinox, northerly, and wintery weather for no long time The spring again southerly, calm, much rain throughout until the dog-days Summer fine and hot, great suffocating heats The Etesian winds blew small and irregular, again, about the season of Arcturus, much rains with north winds The year being southerly, damp, and soft towards winter, all were healthy, except those affected with phthisis, of whom we shall write afterwards

3 Early in spring, along with the prevailing cold, there were many cases of erysipelas, some from a manifest cause, and some not They were of a malignant nature, and proved fatal to many, many had sore-throat and loss of speech There were many cases of ardent fever, phrensy, aphthous affections of the mouth, tumors on the genital organs, of ophthalmia, anthrax, disorder of the bowels, anorexia, with thirst and without it, of disordered urine, large in quantity, and bad in quality, of persons affected with coma for a long time, and then falling into a state of insomnolency There were many cases of failure of crisis, and many of unfavorable crisis, many of dropsy and of phthisis Such were the diseases then epidemic There were patients affected with every one of the species which have been mentioned, and many died The symptoms in each of these cases were as follows

4 In many cases erysipelas, from some obvious cause, such as an accident, and sometimes from even a very small wound, broke out all over the body, especially, in persons about sixty

years of age, about the head, if such an accident was neglected in the slightest degree, and this happened in some who were under treatment, great inflammation took place, and the erysipelas quickly spread all over. In the most of them the abscesses ended in suppurations, and there were great fallings off (sloughing) of the flesh, tendons, and bones, and the defluxion which seated in the part was not like pus, but a sort of putrefaction, and the running was large and of various characters. Those cases in which any of these things happened about the head were accompanied with falling off of the hairs of the head and chin, the bones were laid bare and separated, and there were excessive runnings, and these symptoms happened in fevers and without fevers. But these things were more formidable in appearance than dangerous, for when the concoction in these cases turned to a suppuration, most of them recovered, but when the inflammation and erysipelas disappeared, and when no abscess was formed, a great number of these died. In like manner, the same things happened to whatever part of the body the disease wandered, for in many cases both forearm and arm dropped off, and in those cases in which it fell upon the sides, the parts there, either before or behind, got into a bad state, and in some cases the whole femur and bones of the leg and whole foot were laid bare. But of all such cases, the most formidable were those which took place about the pubes and genital organs.² Such was the nature of these cases when attended with sores, and proceeding from an external cause, but the same things occurred in fevers, before fevers, and after fevers. But those cases in which an abscess was formed, and turned to a suppuration, or a seasonable diarrhœa or discharge of good urine took place, were relieved thereby; but those cases in which none of these symptoms occurred, but they disappeared without a crisis, proved fatal. The greater number of these erysipelatous cases

² The classical reader will here call to his recollection a striking passage in the celebrated description of the Plague of Athens, as given by Thucydides. "For the mischief, being at first seated in the head, spread over the whole body, and if one survived the most formidable symptoms, in attack on the extremities manifested itself, for it was determined to the genital organs and to the hands and feet, and many escaped with losing them, and some with the loss of their eyes" (ii, 49)

took place in the spring, but were prolonged through the summer and during autumn

5 In certain cases there was much disorder, and tumors about the fauces, and inflammations of the tongue, and abscesses about the teeth And many were attacked with impairment or loss of speech, at first, those in the commencement of phthisis, but also persons in ardent fever and in phrenitis

6 The cases of ardent fever and phrenitis occurred early in spring after the cold set in, and great numbers were taken ill at that time, and these cases were attended with acute and fatal symptoms The constitution of the ardent fevers which then occurred was as follows at the commencement they were affected with coma, nausea, and rigors, fever not acute, not much thirst, nor delirium, slight epistaxis, the paroxysms for the most part on even days, and, about the time of the paroxysms, forgetfulness, loss of strength and of speech, the extremities, that is to say, the hands and feet, at all times, but more especially about the time of the paroxysms, were colder than natural, they slowly and imperfectly became warmed, and again recovered their recollection and speech They were constantly affected either with coma, in which they got no sleep, or with insomnolency, attend with pains, most had disorders of the bowels, attended with undigested, thin, and copious evacuations, urine copious, thin, having nothing critical nor favorable about it, neither was there any other critical appearance in persons affected thus, for neither was there any proper hemorrhage, nor any other of the accustomed evacuations, to prove a crisis They died, as it happened, in an irregular manner, mostly about the crisis, but in some instances after having lost their speech for a long time, and having had copious sweats These were the symptoms which marked the fatal cases of ardent fever, similar symptoms occurred in the phrenitic cases, but these were particularly free from thirst, and none of these had wild delirium as in other cases, but they died oppressed by a bad tendency to sleep, and stupor

7 But there were also other fevers, as will be described Many had their mouths affected with aphthous ulcerations There were also many defluxions about the genital parts, and

ulcerations, boils (phymata), externally and internally, about the groins Watery ophthalmies of a chronic character, with pains, fungous excrescences of the eyelids, externally and internally, called fici, which destroyed the sight of many persons There were fungous growths, in many other instances, on ulcers, especially on those seated on the genital organs There were many attacks of carbuncle (anthrax) through the summer, and other affections, which are called "the putrefaction" (*seps*), also large ecthymata, and large tetters (*herpetes*) in many instances

8 And many and serious complaints attacked many persons in the region of the belly In the first place, tenesmus, accompanied with pain, attacked many, but more especially children, and all who had not attained to puberty, and the most of these died There were many cases of lientery and of dysentery, but these were not attended with much pain The evacuations were bilious, and fatty, and thin, and watery, in many instances the disease terminated in this way, with and without fever, there were painful tormina and volvuli of a malignant kind, copious evacuations of the contents of the guts, and yet much remained behind, and the passages did not carry off the pains, but yielded with difficulty to the means administered, for in most cases purgings were hurtful to those affected in this manner, many died speedily, but in many others they held out longer In a word, all died, both those who had acute attacks and those who had chronic, most especially from affections of the belly, for it was the belly which carried them all off

9 All persons had an aversion to food in all the afore-mentioned complaints to a degree such as I never met with before, and persons in these complaints most especially, and those recovering from them, and in all other diseases of a mortal nature Some were troubled with thirst, and some not, and both in febrile complaints and in others no one drank unseasonably or disobeyed injunctions

10 The urine in many cases was not in proportion to the drink administered, but greatly in excess, and the badness of the urine voided was great, for it had not the proper thickness, nor concoction, nor purged properly, for in many cases purgings

by the bladder indicate favorably, but in the greatest number they indicated a melting of the body, disorder of the bowels, pains, and a want of crisis ³

11 Persons laboring under phrenitis and causus were particularly disposed to coma, but also in all other great diseases which occurred along with fever. In the main, most cases were attended either by heavy coma, or by short and light sleep.

12 And many other forms of fevers were then epidemic, of tertian, of quartan, of nocturnal,⁴ of continual, of chronic, of erratic, of fevers attended with nausea, and of irregular fevers. All these were attended with much disorder, for the bowels in most cases were disordered, accompanied with rigors, sweats not of a critical character, and with the state of the urine as described. In most instances the disease was protracted, for neither did the deposits which took place prove critical as in other cases, for in all complaints and in all cases there was difficulty of crisis, want of crisis, and protraction of the disease, but most especially in these. A few had the crisis about the eightieth day, but in most instances it (the disease?) left them irregularly. A few of them died of dropsy without being confined to bed. And in many other diseases people were troubled with swelling, but more especially in phthisical cases.

13 The greatest and most dangerous disease, and the one that proved fatal to the greatest number, was the consumption. With many persons it commenced during the winter, and of these some were confined to bed, and others bore up on foot, the most of those died early in spring who were confined to bed, of the others, the cough left not a single person, but it became milder through the summer, during the autumn, all these were confined to bed, and many of them died, but in the greater number of cases the disease was long protracted. Most of these were suddenly attacked with these diseases, having frequent rigors, often continual and acute fevers, unseasonable, copious,

³ It will readily be understood that a colliquative diabetes would prove a very unfavorable complication of these complaints.

⁴ By nocturnal fevers, according to Galen, was meant quotidians, which had their paroxysms during the night.

and cold sweats throughout, great coldness, from which they had great difficulty in being restored to heat, the bowels variously constipated, and again immediately in a loose state, but towards the termination in all cases with violent looseness of the bowels, a determination downwards of all matters collected about the lungs, urine excessive, and not good, troublesome melting The coughs throughout were frequent, and sputa copious, digested, and liquid, but not brought up with much pain, and even when they had some slight pain, in all cases the purging of the matters about the lungs went on mildly The fauces were not very irritable, nor were they troubled with any saltish humors, but there were viscid, white, liquid, frothy, and copious defluxions from the head But by far the greatest mischief attending these and the other complaints, was the aversion to food, as has been described For neither had they any relish for drink along with their food, but continued without thirst There was heaviness of the body, disposition to coma, in most cases swelling, which ended in dropsy, they had rigors, and were delirious towards death

14 The form of body peculiarly subject to phthisical complaints was the smooth, the whitish, that resembling the lentil, the reddish, the blue-eyed, the leucophlegmatic, and that with the scapulæ having the appearance of wings. and women in like manner, with regard to the melancholic and subsanguineous, phrenitic and dysenteric affections principally attacked them Tenesmus troubled young persons of a phlegmatic temperament Chronic diarrhœa, acrid and viscid discharges from the bowels, attacked those who were troubled with bitter bile

15 To all those which have been described, the season of spring was most inimical, and proved fatal to the greatest numbers the summer was the most favorable to them, and the fewest died then, in autumn, and under the Pleiades, again there died great numbers It appears to me, according to the reason of things, that the coming on of summer should have done good in these cases, for winter coming on cures the diseases of summer, and summer coming on removes the diseases of winter And yet the summer in question was not of itself well constituted, for

it became suddenly hot, southerly, and calm, but, notwithstanding, it proved beneficial by producing a change on the other constitution

16 I look upon it as being a great part of the art to be able to judge properly of that which has been written For he that knows and makes a proper use of these things, would appear to me not likely to commit any great mistake in the art He ought to learn accurately the constitution of every one of the seasons, and of the diseases, whatever that is common in each constitution and disease is good, and whatever is bad, whatever disease will be protracted and end in death, and whatever will be protracted and end in recovery, which disease of an acute nature will end in death, and which in recovery From these it is easy to know the order of the critical days, and prognosticate from them accordingly And to a person who is skilled in these things, it is easy to know to whom, when, and how aliment ought to be administered

SEC 17 SIXTEEN CASES

CASE I—In Thasus, the Parian who lodged above the Temple of Diana was seized with an acute fever, at first of a continual and ardent type, thirsty, inclined to be comatose at first, and afterwards troubled with insomnolency, bowels disordered at the beginning, urine thin On the sixth day, passed oily urine, was delirious On the seventh, all the symptoms were exacerbated, had no sleep, but the urine of the same characters, and the understanding disordered, alvine dejections bilious and fatty On the eighth, a slight epistaxis, small vomiting of verdigris-green matters, slept a little On the ninth, in the same state On the tenth, all the symptoms gave way On the eleventh, he sweated, but not over the whole body, he became cold, but immediately recovered his heat again On the fourteenth, acute fever, discharges bilious, thin, and copious, substances floating in the urine, he became incoherent On the seventeenth, in a painful state, for he had no sleep, and the fever was more intense On the twentieth, sweated all over, apyrexia, dejections bilious, aversion to food, comatose. On the twenty-fourth, had a relapse

On the thirty-fourth, apyrexia, bowels not confined, and he again recovered his heat Fortieth, apyrexia, bowels confined for no long time, aversion to food, had again slight symptoms of fever, and throughout in an irregular form, apyrexia at times, and at others not, for if the fever intermitted, and was alleviated for a little, it immediately relapsed again, he used much and improper food, sleep bad, about the time of the relapse he was delirious, passed thick urine at that time, but troubled, and of bad characters, bowels at first confined, and again loose, slight fevers of a continual type, discharges copious and thin On the hundred and twentieth day he died In this patient the bowels were constantly from the first either loose, with bilious, liquid, and copious dejections, or constipated with hot and undigested fæces, the urine throughout bad, for the most part coma, or insomnolency with pain, continued aversion to food Ardent fever

Explanation of the characters It is probable that the weakness produced by the fever, the phrenitis, and affection of the hypochondrium caused death on the hundred and twentieth day

CASE II—In Thasus, the woman who lodged near the Cold Water, on the third day after delivery of a daughter, the lochial discharge not taking place, was seized with acute fever, accompanied with rigors But a considerable time before delivery she was feverish, confined to bed, and loathed her food After the rigor which took place, continual and acute fevers, with rigors On the eighth and following days, was very incoherent, and immediately afterwards became collected, bowels disordered, with copious, thin, watery, and bilious stools, no thirst On the eleventh was collected, but disposed to coma, urine copious, thin, and black, no sleep On the twentieth, slight chills, and immediately afterwards was warm, slight incoherence; no sleep, with regard to the bowels, in the same condition, urine watery, and copious On the twenty-seventh, free from fever, bowels constipated, not long afterwards violent pain of the right hip-joint for a considerable time, fevers afterwards supervened, urine watery On the fortieth, complaints about the hip-joint better, continued coughs, with copious, watery sputa, bowels constipated, aversion to food, urine the same, fever not leaving

her entirely, but having paroxysms in an irregular form, sometimes present, sometimes not On the sixtieth, the coughs left her without a crisis, for no concoction of the sputa took place, nor any of the usual abscesses, jaw on the right side convulsively retracted, comatose, was again incoherent, and immediately became collected, utter aversion to food, the jaw became relaxed, alvine discharges small, and bilious, fever more acute, affected with rigors, on the following days lost her speech, and again became collected, and talked On the eightieth she died In this case the urine throughout was black, thin, and watery, coma supervened, there was aversion to food, despondency, and insomnolency, irritability, restlessness, she was of a melancholic turn of mind

Explanation of the characters It is probable that the suppression of the lochial discharge caused death on the eightieth day

CASE III —In Thasus, Pythion, who was lodged above the Temple of Hercules, from labor, fatigue, and neglected diet, was seized with strong rigor and acute fever, tongue dry, thirsty, and bilious, had no sleep, urine darkish, eneorema floating on the top of the urine, did not subside On the second day, about noon, coldness of the extremities, especially about the hands and head, loss of speech and of articulation, breathing short for a considerable time, recovered his heat, thirst, passed the night quietly, slight sweats about the head On the third, passed the day in a composed state, in the evening, about sunset, slight chills, nausea, agitation, passed the night in a painful state, had no sleep, small stools of compact fæces passed from the bowels On the fourth, in the morning, composed, about noon all the symptoms became exacerbated, coldness, loss of speech, and of articulation, became worse, recovered his heat after a time, passed black urine, having substances floating in it, the night quiet, slept On the fifth, seemed to be lightened, but a painful weight about the belly, thirsty, passed the night in a painful state On the sixth, in the morning, in a quiet state, in the evening the pains greater, had a paroxysm, in the evening the bowels properly opened by a small clyster, slept at night

On the seventh, during the day, in a state of nausea, somewhat disturbed, passed urine of the appearance of oil, at night, much agitation, was incoherent, did not sleep On the eighth, in the morning, slept a little, but immediately coldness, loss of speech, respiration small and weak, but in the evening recovered his heat again, was delirious, but towards day was somewhat lightened, stools small, bilious, and unmixed On the ninth, affected with coma, and with nausea when roused, not very thirsty, about sunset he became restless and incoherent, pass a bad night On the tenth, in the morning, had become speechless, great coldness, acute fever, much perspiration, he died His suffering were on the even days

Explanation of the characters It is probable that the excessive sweats caused death on the tenth day

CASE IV—The patient affected with phrenitis, having taken to bed on the first day, vomited largely of verdigris-green and thin matters, fever, accompanied with rigors, copious and continued sweats all over, heaviness of the head and neck, with pain, urine thin, substances floating in the urine small, scattered, did not subside, had copious dejections from the bowels, very delirious, no sleep On the second, in the morning, loss of speech, acute fever, he sweated, fever did not leave him, palpitations over the whole body, at night, convulsions On the third, all the symptoms exacerbated, he died

Explanation of the characters It is probable that the sweats and convulsions caused death

CASE V—In Larissa, a man, who was bald, suddenly was seized with pain in the right thigh, none of the things which were administered did him any good On the first day, fever acute, of the ardent type, not agitated, but the pains persisted. On the second, the pains in the thigh abated, but the fever increased, somewhat tossed about, did not sleep, extremities cold, passed a large quantity of urine, not of a good character On the third, the pain of the thigh ceased, derangement of the intellect, confusion, and much tossing about On the fourth, about noon, he died An acute disease

CASE VI—In Abdera, Pericles was seized with a fever of the

acute, continual type, with pain, much thirst, nausea, could not retain his drink, somewhat swelled about the spleen, with heaviness of the head. On the first day, had hemorrhage from the left nostril, but still the fever became more violent, passed much muddy, white urine, which when allowed to stand did not subside. On the second day, all the symptoms were exacerbated, yet the urine was thick, and more inclined to have a sediment, the nausea less, he slept. On the third, fever was milder, abundance of urine, which was concocted, and had a copious sediment, passed a quiet night. On the fourth, had a copious and warm sweat all over about noon, was free of fever, had a crisis, no relapse. An acute affection.

CASE VII —In Abdera, the young woman who was lodged in the Sacred Walk was seized with an ardent fever. She was thirsty, and could not sleep, had menstruation for the first time. On the sixth, much nausea, flushing, was chilly, and tossed about. On the seventh, in the same state, urine thin, but of a good color, no disturbance about the bowels. On the eighth, deafness, acute fever, insomnolency, nausea, rigors, became collected, urine the same. On the ninth, in the same state, and also on the following days, thus the deafness persisted. On the fourteenth, disorder of the intellect; the fever abated. On the seventeenth, a copious hemorrhage from the nose, the deafness slightly better, and on the following days, nausea, deafness, and incoherence. On the twentieth, pain of the feet, deafness and delirium left her, a small hemorrhage from the nose; sweat, apyrexia. On the twenty-fourth, the fever returned, deafness again, pain of the feet remained, incoherence. On the twenty-seventh, had a copious sweat, apyrexia; the deafness left her; the pain of her feet partly remained, in other respects had a complete crisis.

Explanation of the characters. It is probable that the restoration of health on the twentieth day was the result of the evacuation of urine.

CASE VIII —In Abdera, Anaxion, who was lodged near the Thracian Gates, was seized with an acute fever, continued pain of the right side, dry cough, without expectoration during the

first days, thirst, insomnolency, urine well colored, copious, and thin On the sixth, delirious, no relief from the warm applications On the seventh, in a painful state, for the fever increased, while the pains did not abate, and the cough was troublesome, and attended with dyspnœa On the eighth, I opened a vein at the elbow, and much blood, of a proper character, flowed, the pains were abated, but the dry coughs continued On the eleventh, the fever diminished, slight sweats about the head, coughs, with more liquid sputa, he was relieved On the twentieth, sweat, apyrexia, but after the crisis he was thirsty, and the expectorations were not good On the twenty-seventh the fever relapsed, he coughed, and brought up much concocted sputa sediment in the urine copious and white, he became free of thirst, and the respiration was good On the thirty-fourth, sweated all over, apyrexia, general crisis

Explanation of the characters It is probable that the evacuation of the sputa brought about the recovery on the thirty-fourth day

CASE IX.—In Abdera, Heropythus, while still on foot, had pain in the head, and not longer afterwards he took to bed, he lived near the High Street Was seized with acute fever of the ardent type, vomitings at first of much bilious matter, thirst, great restlessness, urine thin, black, substances sometimes floating high in it, and sometimes not, passed the night in a painful state, paroxysms of the fever diversified, and for the most part irregular About the fourteenth day, deafness, the fever increased, urine the same On the twentieth and following days, much delirium On the thirtieth, copious hemorrhage from the nose, and became more collected, deafness continued, but less, the fever diminished, on the following days, frequent hemorrhages, at short intervals About the sixtieth, the hemorrhages ceased, but violent pain of the hip-joint, and increase of fever Not long afterwards, pains of all the inferior parts, it then became a rule, that either the fever and deafness increased, or, if these abated and were lightened, the pains of the inferior parts were increased About the eightieth day, all the complaints gave way, without leaving any behind, for the urine was of a good color, and had a copious sediment, while the delirium

became less About the hundredth day, disorder of the bowels, with copious and bilious evacuations, and these continued for a considerable time, and again assumed the dysenteric form with pain, but relief of all the other complaints On the whole, the fevers went off, and the deafness ceased On the hundred and twentieth day, had a complete crisis Ardent fever

Explanation of the characters It is probable that the bilious discharge brought about the recovery on the hundred and twentieth day

CASE X.—In Abdera, Nicodemus was seized with fever from venery and drinking At the commencement he was troubled with nausea and cardialgia, thirsty, tongue was parched, urine thin and dark On the second day, the fever exacerbated, he was troubled with rigors and nausea; had no sleep, vomited yellow bile, urine the same, passed a quiet night, and slept On the third, a general remission, amelioration, but about sunset felt again somewhat uncomfortable, passed an uneasy night On the fourth, rigor, much fever, general pains, urine thin, with substances floating in it, again a quiet night On the fifth, all the symptoms remained, but there was an amelioration On the sixth, some general pains, substances floating in the urine, very incoherent On the seventh, better On the eighth, all the other symptoms abated On the tenth, and following days, there were pains, but all less, in this case throughout, the paroxysms and pains were greater on the even days. On the twentieth, the urine white and thick, but when allowed to stand had no sediment, much sweat, seemed to be free from fever, but again in the evening he became hot, with the same pains, rigor, thirst, slightly incoherent On the twenty-fourth, urine copious, white, with an abundant sediment, a copious and warm sweat all over, apyrexia, the fever came to its crisis

Explanation of the characters It is probable that the cure was owing to the bilious evacuations and the sweats

CASE XI.—In Thasus, a woman, of a melancholic turn of mind, from some accidental cause of sorrow, while still going about, became affected with loss of sleep, aversion to food, and had thirst and nausea She lived near the Pylades, upon the Plain On the first, at the commencement of night, frights, much

talking, despondency, slight fever, in the morning, frequent spasms, and when they ceased, she was incoherent and talked obscurely, pains frequent, great, and continued On the second, in the same state, had no sleep, fever more acute On the third, the spasms left her, but coma, and disposition to sleep, and again awaked, started up, and could not contain herself, much incoherence, acute fever, on that night a copious sweat all over, apyrexia, slept, quite collected, had a crisis About the third day, the urine black, thin, substances floating in it generally round, did not fall to the bottom, about the crisis a copious menstruation

CASE XII —In Larissa, a young unmarried woman was seized with a fever of the acute and ardent type, insomnolency, thirst, tongue sooty and dry, urine of a good color, but thin On the second, in an uneasy state, did not sleep On the third, alvine discharges copious, watery, and greenish, and on the following days passed such with relief On the fourth, passed a small quantity of thin urine, having substances floating towards its surface, which did not subside, was delirious towards night On the sixth, a great hemorrhage from the nose, a chill, with a copious and hot sweat all over; apyrexia, had a crisis. In the fever, and when it had passed the crisis, the menses took place for the first time, for she was a young woman Throughout she was oppressed with nausea, and rigors, redness of the face, pain of the eyes, heaviness of the head, she had no relapse, but the fever came to a crisis The pains were on the even days

CASE XIII —Apollonius, in Abdera, bore up (under the fever?) for some time, without betaking himself to bed His viscera were enlarged, and for a considerable time there was a constant pain about the liver, and then he became affected with jaundice, he was flatulent, and of a whitish complexion Having eaten beef, and drunk unseasonably, he became a little heated at first, and betook himself to bed, and having used large quantities of milk, that of goats and sheep, and both boiled and raw, with a bad diet otherwise, great mischief was occasioned by all these things, for the fever was exacerbated, and of the food taken scarcely any portion worth mentioning was passed from the bowels, the urine was thin and scanty, no sleep, troublesome

MEDICAL CLASSICS

VOL 3

October, 1938

NO 2



CONTENTS

Works of Hippocrates

On Injuries of the Head - - - - -	145
On the Surgery - - - - -	161
On Fractures - - - - -	171
On the Articulations - - - - -	210
Mochlicus - - - - -	278

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MEDICAL CLASSICS

VOL. 3

October, 1938

NO. 2



On Injuries of the Head

MEN'S heads are by no means all like to one another, nor are the sutures of the head of all men constructed in the same form. Thus, whoever has a prominence in the anterior part of the head (by prominence is meant the round protuberant part of the bone which projects beyond the rest of it), in him the sutures of the head take the form of the Greek letter *tau*, T, for the head has the shorter line running transverse before the prominence, while the other line runs through the middle of the head, all the way to the neck. But whoever has the prominence in the back part of the head, in him the sutures are constructed in quite the opposite form to the former, for in this case the shorter line runs in front of the prominence, while the longer runs through the middle all along to the forehead. But whoever has a prominence of the head both before and behind, in him the sutures resemble the Greek letter *êta* H, for the long lines of the letter run transverse before each prominence while the short one runs through the middle and terminates in the long lines. But whoever has no prominence on either part he has the sutures of the head resembling the Greek letter *chi*, for the one line comes transverse to the temple while the other passes along the middle of the head. The bone at the middle of the head is double, the hardest and most compact part being the upper portion, where it is connected with the skin, and the lowest, where it is connected with the meninx (*dura mater*), and from the uppermost and lowermost parts the bone gradually becomes softer and less compact, till you come to the *diploe*. The *diploe* is the most porous, the softest, and most cavernous part. But the whole bone of the head, with the

exception of a small portion of the uppermost and lowermost portions of it, is like a sponge, and the bone has in it many juicy substances, like caruncles, and if one will rub them with the fingers, some blood will issue from them. There are also in the bone certain very slender and hollow vessels full of blood. So it is with regard to hardness, softness, and porosity.

2 In respect to thickness and thinness, the thinnest and weakest part of the whole head is the part about the bregma, and the bone there has the smallest and thinnest covering of flesh upon it, and the largest proportion of brain is situated in that region of the head. And hence it happens that from similar or even smaller wounds and instruments, when a person is wounded to the same or a less degree, the bone of the head there is more contused, fractured, and depressed, and that injuries there are more deadly and more difficult to cure, and it is more difficult to save one's life in injuries there than in any other part of the head, that from having sustained a similar or even a less wound a man will die, and that, too, in a shorter space of time than from a wound in any other part of the head. For the brain about the bregma feels more quickly and strongly any mischief that may occur to the flesh or the bone, for the brain about the bregma is in largest quantity, and is covered by the thinnest bone and the least flesh. Of the other portions, the weakest is that about the temples, for it is the conjunction of the lower jaw with the cranium, and there is motion there up and down as at a joint, and the organ of hearing is near it, and further, a hollow and important vein runs along the temple. But the whole bone of the head behind the vertex and the ear is stronger than the whole anterior part, and the bone itself has a larger and deeper covering of flesh upon it. And hence it follows, that when exposed to the same or even greater injuries from instruments of the same or greater size, the bone is less liable to be fractured and depressed than elsewhere, and that in a fatal accident the patient will live longer when the wound is in the posterior part of the head than when elsewhere, and that pus takes longer time to form and penetrate through the bone to the brain, owing to the thickness of the bone, and moreover, as

there is less brain in that part of the head, more persons who are wounded in the back part of the head escape than of those who are wounded in the anterior part And in fatal cases, a man will survive longer in winter than in summer, whatever be the part of the head in which the wound is situated

3 As to the *hædræ* (dints or marks?) of sharp and light weapons, when they take place in the bone without fissure, contusion, or depression inwards (and these take place equally in the anterior and posterior part of the head), death, when it does occur, does not properly result from them A suture appearing in a wound, when the bone is laid bare, on whatever part of the head the wound may have been inflicted, is the weakest point of the head to resist a blow or a weapon, when the weapon happens to be impinged into the suture itself, but more especially when this occurs in the bregma at the weakest part of the head, and the sutures happen to be situated near the wound, and the weapon has hit the sutures themselves

4 The bone in the head is liable to be wounded in the following modes, and there are many varieties in each of these modes of fracture When a wounded bone breaks, in the bone comprehending the fissure, contusion necessarily takes place where the bone is broken, for an instrument that breaks the bone occasions a contusion thereof more or less, both at the fracture and in the parts of the bone surrounding the fracture This is the first mode But there are all possible varieties of fissures, for some of them are fine, and so very fine that they cannot be discovered, either immediately after the injury, or during the period in which it would be of use to the patient if this could be ascertained And some of these fissures are thicker and wider, certain of them being very wide And some of them extend to a greater, and some to a smaller, distance And some are more straight, nay, completely straight, and some are more curved, and that in a remarkable degree And some are deep, so as to extend downwards and through the whole bone, and some are less so, and do not penetrate through the whole bone

5 But a bone may be contused, and yet remain in its natural condition without any fracture in it; this is the second mode

And there are many varieties of contusion, for they occur to a greater and less degree, and to a greater depth, so as sometimes to extend through the whole bone, or to a less depth, so as not to extend through the whole bone, and to a greater and smaller length and breadth. But it is not possible to recognize any of these varieties by the sight, so as to determine their form and extent, neither, indeed, is it visible to the eyes when any mischief of this kind takes place, and immediately after the injury, whether or not the bone has been actually bruised, as is likewise the case with certain fractures at a distance from the seat of injury.

6 And the bone being fractured, is sometimes depressed inwards from its natural level along with the fractures, otherwise there would be no depression, for the depressed portion being fractured and broken off, is pushed inwards, while the rest of the bone remains in its natural position, and in this manner a fracture is combined with the depression. This is the third mode. There are many varieties of depression, for it may comprehend a greater and a small extent of bone, and may either be to a greater depth, or less so, and more superficial.

7 When a *hedra*, or dint of a weapon, takes place in a bone, there may be a fracture combined with it, and provided there be a fracture, contusion must necessarily be joined, to a greater or less extent, in the seat of the dint and fracture, and in the bone which comprehends them. This is the fourth mode. And there may be a *hedra*, or indentation of the bone, along with contusion of the surrounding bone, but without any fracture either in the *hedra* or in the contusion inflicted by the weapon. But the indentation of a weapon takes place in a bone, and is called *hedra*, when the bone remaining in its natural state, the weapon which struck against the bone leaves its impression on the part which it struck. In each of these modes there are many varieties, with regard to the contusion and fracture, if both these be combined with the *hedra*, or if contusion alone, as it has been already stated that there are many varieties of contusion and fracture. And the *hedra*, or dint, of itself may be longer and shorter, crooked, straight, and circular, and there are many varieties of this mode, according to the shape of the weapon, and they may

be more or less deep, and narrower or broader, and extremely broad. When a part is cleft, the cleft or notch which occurs in the bone, to whatever length or breadth, is a *hedra*, if the other bones comprehending the cleft remain in their natural position, and be not driven inwards, for in this case it would be a depression, and no longer a *hedra*.

8. A bone may be injured in a different part of the head from that on which the person has received the wound, and the bone has been laid bare. This is the fifth mode. And for this misfortune, when it occurs, there is no remedy, for when this mischief takes place, there is no means of ascertaining by any examination whether or not it has occurred, or on what part of the head.

9. Of these modes of fracture, the following require trepanning: the contusion, whether the bone be laid bare or not; and the fissure, whether apparent or not. And if, when an indentation (*hedra*) by a weapon takes place in a bone it be attended with fracture and contusion, and even if contusion alone, without fracture, be combined with the indentation, it requires trepanning. A bone depressed from its natural position rarely requires trepanning, and those which are most pressed and broken require trepanning the least, neither does an indentation (*hedra*) without fracture and contusion require trepanning, nor does a notch, provided it is large and wide, for a notch and a *hedra* are the same.

10. In the first place, one must examine the wounded person, in what part of the head the wound is situated, whether in the stronger or weaker parts, and ascertain respecting the hairs about the wound, whether they have been cut off by the instrument, and have gone into the wound, and if so, one should declare that the bone runs the risk of being denuded of flesh, and of having sustained some injury from the weapon. These things one should say from a distant inspection, and before laying a hand on the man; but on a close examination one should endeavor to ascertain clearly whether the bone be denuded of flesh or not, and if the denuded bone be visible to the eyes, this will be enough, but otherwise an examination must be made with the sound. And if you find the bone denuded of the flesh,

and not safe from the wound, you must first ascertain the state of the bone, and the extent of the mischief, and what assistance it stands in need of. One should also inquire of the wounded person how and in what way he sustained the injury; and if it be not apparent whether the bone has sustained an injury or not, it will be still more necessary, provided the bone be denuded, to make inquiry how the wound occurred, and in what manner, for when contusions and fractures exist in the bone, but are not apparent, we must ascertain, in the first place from the patient's answers, whether or not the bone has sustained any such injuries, and then find out the nature of the case by word and deed, with the exception of sounding. For sounding does not discover to us whether the bone has sustained any of these injuries or not, but sounding discovers to us an indentation inflicted by a weapon, and whether a bone be depressed from its natural position, and whether the bone be strongly fractured, all which may also be ascertained visibly with the eyes.

II And a bone sustains fractures, either so fine as to escape the sight, or such as are apparent, and contusions which are not apparent, and depression from its natural position, especially when one person is intentionally wounded by another, or when, whether intentionally or not, a blow or stroke is received from an elevated place, and if the instrument in the hand, whether used in throwing or striking, be of a powerful nature, and if a stronger person wound a weaker. Of those who are wounded in the parts about the bone, or in the bone itself, by a fall, he who falls from a very high place upon a very hard and blunt object is in most danger of sustaining a fracture and contusion of the bone, and of having it depressed from its natural position, whereas he that falls upon more level ground, and upon a softer object, is likely to suffer less injury in the bone, or it may not be injured at all. Of those instruments which, falling upon the head, wound the parts about the bone, or the bone itself, that which falls from a very high place, and the least on a level with the person struck, and which is at the same time very hard, very blunt, and very heavy, and which is the least light, sharp, and soft, such an instrument would occasion a fracture and

contusion of the bone. And there is most danger that the bone may sustain these injuries, under such circumstances, when the wound is direct and perpendicular to the bone, whether struck from the hand or from a throw, or when any object falls upon the person, or when he is wounded by falling, or in whatever way the bone sustains a direct wound from this instrument. Those weapons which graze the bone obliquely are less apt to fracture, contuse, or depress the bone, even when the bone is denuded of flesh, for in some of those wounds thus inflicted the bone is not laid bare of the flesh. Those instruments more especially produce fractures in the bone, whether apparent or not, and contusions, and inward depression of the bone, which are rounded, globular, smooth on all sides, blunt, heavy, and hard, and such weapons bruise, compress, and pound the flesh, and the wounds inflicted by such instruments, whether obliquely or circularly, are round, and are more disposed to suppurate, and to have a discharge, and take longer time to become clean, for the flesh which has been bruised and pounded must necessarily suppurate and slough away. But weapons of an oblong form, being, for the most part, slender, sharp, and light, penetrate the flesh rather than bruise it, and the bone in like manner, and such an instrument may occasion a *hedra* and a cut (for a *hedra* and a cut are same thing), but weapons of this description do not produce contusions, nor fractures, nor depressions inwardly. And in addition to the appearances in the bone, which you can detect by the sight, you should make inquiry as to all these particulars (for they are symptoms of a greater or less injury), whether the wounded person was stunned, and whether darkness was diffused over his eyes, and whether he had vertigo, and fell to the ground.

12 When the bone happens to be denuded of flesh by the weapon, and when the wound occurs upon the sutures, it is difficult to distinguish the indentation (*hedra*) of a weapon which is clearly recognized in other parts of the bone, whether it exist or not, and especially if the *hedra* be seated in the sutures themselves. For the suture being rougher than the rest of the bone occasions confusion, and it is not clear which is the suture, and which the mark inflicted by the instrument, unless the latter

(*hedra*) be large Fracture also for the most part is combined with the indentation when it occurs in the sutures, and this fracture is more difficult to discern when the bone is broken, on this account, that if there be a fracture, it is situated for the most part in the suture. For the bone is liable to be broken and slackened there, owing to the natural weakness of the bone there, and to its porosity, and from the suture being readily ruptured and slackened but the other bones which surround the suture remain unbroken, because they are stronger than the suture. For the fracture which occurs at the suture is also a slackening of the suture, and it is not easy to detect whether the bone be broken and slackened by the indentation of a weapon occurring in the suture, or from a contusion of the bone at the sutures, but it is still more difficult to detect a fracture connected with contusion For the sutures, having the appearance of fissures, elude the discernment and sight of the physician, as being rougher than the rest of the bone, unless the bone be strongly cut and slackened, (for a cut and a *hedra* are the same thing) But it is necessary, if the wound has occurred at the sutures, and the weapon has impinged on the bone or the parts about it, to pay attention and find out what injury the bone has sustained For a person wounded to the same, or a much smaller, extent, and by weapons of the same size and quality, and even much less, will sustain a much greater injury, provided he has received the blow at the sutures, than if it was elsewhere And many of these require trepanning, but you must not apply the trepan to the sutures themselves, but on the adjoining bone

13 And with regard to the cure of wounds in the head, and the mode of detecting injuries in the bone which are not apparent, the following is my opinion —In a wound of the head, you must not apply anything liquid, not even wine, but as little as possible, nor a cataplasm, nor conduct the treatment with tents, nor apply a bandage to an ulcer on the head, unless it be situated on the forehead, in the part which is bare of hairs, or about the eyebrow and eye, for wounds occurring there require cataplasms and bandages more than upon any other part of the head. For the rest of the head surrounds the whole forehead, and the

wounds wherever situated become inflamed and swelled, owing to an influx of blood from the surrounding parts. And neither must you apply cataplasms and bandages to the forehead at all times, but when the inflammation is stopped and the swelling has subsided, you must give up the cataplasms and bandages. A wound in any other part of the head must not be treated with tents, bandages, or cataplasms, unless it also requires incision. You must perform incision on wounds situated on the head and forehead, whenever the bone is denuded of flesh, and appears to have sustained some injury from the blow, but the wound has not sufficient length and breadth for the inspection of the bone, so that it may be seen whether it has received any mischief from the blow, and of what nature the injury is, and to what extent the flesh has been contused, and whether the bone has sustained any injury, or whether it be uninjured by the blow, and has suffered no mischief, and with regard to the treatment, what the wound, and the flesh, and the injury of the bone stand in need of. Ulcers of this description stand in need of incision, and, if the bone be denuded of the flesh, and if it be hollow, and extend far obliquely, we cut up the cavity wherever the medicine cannot penetrate readily, whatever medicine it may be, and wounds which are more inclined to be circular and hollow, and for the most part others of the like shape, are cut up by making a double incision in the circle lengthways, according to the figure of the man, so as to make the wound of a long form. Incisions may be practiced with impunity on other parts of the head, with the exception of the temple and the parts above it, where there is a vein that runs across the temple, in which region an incision is not to be made. For convulsions seize on a person who has been thus treated, and if the incision be on the left temple, the convulsions seize on the right side, and if the incision be on the right side, the convulsions take place on the left side.

14 When, then, you lay open a wound in the head on account of the bones having been denuded of the flesh, as wishing to ascertain whether or not the bone has received an injury from the blow, you must make an incision proportionate to the size of the wound, and as much as shall be judged necessary. And

in making the incision you must separate the flesh from the bone where it is united to the membrane (*pericranium*?) and to the bone, and then fill the whole wound with a tent, which will expand the wound very wide next day with as little pain as possible, and along with the tents apply a cataplasm, consisting of a mass (*maza*) of fine flour pounded in vinegar, or boiled so as to render it as glutinous as possible. On the next day, when you remove the tent, having examined the bone to see what injury it has sustained, if the wound in the bone be not right seen by you, nor can you discover what mischief the bone itself has sustained, but the instrument seems to have penetrated to the bone so as to have injured it, you must scrape the bone with a raspatory to a depth and length proportionate to the suture of the patient, and again in a transverse direction, for the sake of the fractures which are not seen, and of the contusions which are not discovered, as not being accompanied with depression of the bone from its natural position. For the scraping discovers the mischief, if the injuries in the bone be not otherwise manifest. And if you perceive an indentation (*hedra*) left in the bone by the blow, you must scrape the dint itself and the surrounding bones, lest, as often happens, there should be a fracture and contusion, or a contusion alone, combined with the dint, and escape observation. And when you scrape the bone with the raspatory, and it appears that the wound in the bone requires the operation, you must not postpone it for three days, but do it during this period, more especially if the weather be hot, and you have had the management of the treatment from the commencement. If you suspect that the bone is broken or contused, or has sustained both these injuries, having formed your judgment from the severity of the wound, and from the information of the patient, as that the person who inflicted the wound, provided it was done by another person, was remarkably strong, and that the weapon by which he was wounded was of a dangerous description, and then that the man had been seized with vertigo, dimness of vision, and stupor, and fell to the ground,—under these circumstances, if you cannot discover whether the bone be broke, contused, or both the one and the other, nor can see

the truth of the matter, you must dissolve the jet-black ointment, and fill the wound with it when this dissolved, and apply a linen rag smeared with oil, and then a cataplasm of the maza with a bandage, and on the next day, having cleaned out the wound, scrape the bone with the raspatory. And if the bone is not sound, but fractured and contused, the rest of it which is scraped will be white, but the fracture and contusion, having imbibed the preparation, will appear black, while the rest of the bone is white. And you must again scrape more deeply the fracture where it appears black, and, if you thus remove the fissure, and cause it to disappear, you may conclude that there has been a contusion of the bone to a greater or less extent, which has occasioned the fracture that has disappeared under the raspatory, but it is less dangerous, and a matter of less consequence, when the fissure has been effaced. But if the fracture extend deep, and do not seem likely to disappear when scraped, such an accident requires trepanning. But having performed this operation, you must apply the other treatment to the wound.

15 You must be upon your guard lest the bone sustain any injury from the fleshy parts if not properly treated. When the bone has been sawed and otherwise denuded, whether it be actually sound, or only appears to be so, but has sustained some injury from the blow, there may be danger of its suppurating (although it would not otherwise have done so), if the flesh which surrounds the bone be ill cured, and become inflamed and strangled, for it gets into a febrile state, and becomes much inflamed. For the bone acquires heat and inflammation from the surrounding flesh, along with irritation and throbbing, and the other mischiefs which are in the flesh itself, and from these it gets into a state of suppuration. It is a bad thing for the flesh (*granulations*?) in an ulcer to be moist and mouldy, and to require a long time to become clean. But the wound should be made to suppurate as quickly as possible, for, thus the parts surrounding the wound would be the least disposed to inflammation, and would become the soonest clean, for the flesh which has been chopped and bruised by the blow, must necessarily suppurate and slough away. But when cleaned the wound must

be dried, for thus the wound will most speedily become whole, when flesh devoid of humors grows up, and thus there will be no fungous flesh in the sore. The same thing applies to the membrane which surrounds the brain for when, by sawing the bone, and removing it from the meninx, you lay the latter bare, you must make it clean and dry as quickly as possible, lest being in a moist state for a considerable time, it become soaked therewith and swelled, for when these things occur, there is danger of its mortifying.

16 A piece of bone that must separate from the rest of the bone, in consequence of a wound in the head, either from the indentation (*hedra*) of a blow in the bone, or from the bone being otherwise denuded for a long time, separates mostly by becoming exsanguous. For the bone becomes dried up and loses its blood by time and a multiplicity of medicines which are used, and the separation will take place most quickly, if one having cleaned the wound as quickly as possible will next dry it, and the piece of bone, whether larger or smaller. For a piece of bone which is quickly dried and converted, as it were, into a shell, is most readily separated from the rest of the bone which retains its blood and vitality, for, the part having become exsanguous and dry, more readily drops off from that which retains its blood and is alive.

17 Such pieces of bone as are depressed from their natural position, either being broken off or chopped off to a considerable extent, are attended with less danger, provided the membrane be safe, and bones which are broken by numerous and broader fractures are still less dangerous and more easily extracted. And you must not trepan any of them, nor run any risks in attempting to extract the pieces of bone, until they rise up of their own accord, upon the subsidence of the swelling. They rise up when the flesh (*granulations*) grows below, and it grows from the diploe of the bone, and from the sound portion, provided the upper table alone be in a state of necrosis. And the flesh will shoot up and grow below the more quickly, and the pieces of bone ascend, if one will get the wound to suppurate and make it clean as quickly as possible. And when both the tables of the

bone are driven in upon the membrane, I mean the upper and lower, the wound, if treated in the same way, will very soon get well, and the depressed bones will quickly rise up

18. The bones of children are thinner and softer, for this reason, that they contain more blood [than those of adults], and they are porous and spongy, and neither dense nor hard. And when wounded to a similar or inferior degree by weapons of the same or even of an inferior power, the bone of a young person more readily and quickly suppurates, and that in less time than the bone of an older person, and in accidents, which are to prove fatal, the younger person will die sooner than the elder. But if the bone is laid bare of flesh, one must attend and try to find out, what even is not obvious to the sight, and discover whether the bone be broken and contused, or only contused, and if, when there is an indentation in the bone, whether contusion, or fracture, or both be joined to it, and if the bone has sustained any of these injuries, we must give issue to the blood by perforating the bone with a small trepan, observing the greatest precautions, for the bone of young persons is thinner and more superficial than that of elder persons.

19. When a person has sustained a mortal wound on the head, which cannot be cured, nor his life preserved, you may form an opinion of his approaching dissolution, and foretell what is to happen from the following symptoms which such a person experiences. When a bone is broken, or cleft, or contused, or otherwise injured, and when by mistake it has not been discovered, and neither the raspatory nor trepan has been applied as required, but the case has been neglected as if the bone were sound, fever will generally come on before the fourteenth day if in winter, and in summer the fever usually seizes after seven days. And when this happens, the wound loses its color, and the inflammation dies in it, and it becomes glutinous, and appears like a pickle, being of a tawny and somewhat livid color, and the bone then begins to sphacelate, and turns black where it was white before, and at last becomes pale and blanched. But when suppuration is fairly established in it, small blisters form on the tongue and he dies delirious. And, for the most part,

convulsions seize the other side of the body, for, if the wound be situated on the left side, the convulsions will seize the right side of the body, or if the wound be on the right side of the head, the convulsion attacks the left side of the body. And some become apoplectic. And thus they die before the end of seven days, if in summer, and before fourteen, if in winter. And these symptoms indicate, in the same manner, whether the wound be older or more recent. But if you perceive that fever is coming on, and that any of these symptoms accompany it, you must not put off, but having sawed the bone to the membrane (*meninx*), or scraped it with a raspatory, (and it is then easily sawed or scraped,) you must apply the other treatment as may seem proper, attention being paid to circumstances.

20 When in any wound of the head, whether the man has been trepanned or not, but the bone has been laid bare, a red and erysipelatous swelling supervenes in the face, and in both eyes, or in either of them, and if the swelling be painful to the touch, and if fever and rigor come on, and if the wound look well, whether as regards the flesh or the bone, and if the parts surrounding the wound be well, except the swelling in the face, and if the swelling be not connected with any error in the regimen, you must purge the bowels in such a case with a medicine which will evacuate bile, and when thus purged the fever goes off, the swelling subsides, and the patient gets well. In giving the medicine you must pay attention to the strength of the patient.¹

21 With regard to trepanning, when there is a necessity for it, the following particulars should be known. If you have had the management of the case from the first, you must not at once saw the bone down to the *meninx*, for it is not proper that the membrane should be laid bare and exposed to injuries for a length of time, as in the end it may become fungous. And there is another danger if you saw the bone down to the *meninx* and remove it at once, lest in the act of sawing you should wound the *meninx*. But in trepanning, when only a very little of the bone remains to be sawed through, and the bone can be moved,

¹ The practice advocated in this paragraph is alluded to by Paulus Ægineta, in his chapter on Fractures of the Skull (vi, 90)

you must desist from sawing, and leave the bone to fall out of itself² For to a bone not sawed through, and where a portion is left of the sawing, no mischief can happen, for the portion now left is sufficiently thin In other respects you must conduct the treatment as may appear suitable to the wound And in trepanning you must frequently remove the trepan, on account of the heat in the bone, and plunge it in cold water For the trepan being heated by running round, and heating and drying the bone, burns it and makes a larger piece of bone around the sawing to drop off, than would otherwise do And if you wish to saw at once down to the membrane, and then remove the bone, you must also, in like manner, frequently take out the trepan and dip it in cold water But if you have not charge of the treatment from the first, but undertake it from another after a time, you must saw the bone at once down to the meninx with a serrated trepan, and in doing so must frequently take out the trepan and examine with a sound (specillum), and otherwise along the tract of the instrument For the bone is much sooner sawn through, provided there be matter below it and in it, and it often happens that the bone is more superficial,³ especially if the wound is situated in that part of the head where the bone is rather thinner than in other parts But you must take care where you apply the trepan, and see that you do so only where it appears to be particularly thick, and having fixed the instrument there, that you frequently make examinations and endeavor by moving the bone to bring it up Having removed it, you must apply the other suitable remedies to the wound And if, when you have the management of the treatment from the first, you wish to saw through the bone at once, and remove it from the membrane, you must, in like manner, examine the tract of the instrument frequently with the sound,

² The operation here described by our author is the more deserving of attention, as it appears to have been peculiar to him It is not described by Celsus, Paulus Æginus, Albucasis, nor any one of the ancient authorities, as far as I can find, neither am I aware of its having been attempted in modern times The object of it, however, seems to be very rational, namely, to avoid doing serious injury to the dura mater by tearing the bone forcibly from it at once

and see that it is fixed on the thickest part of the bone, and endeavor to remove the bone by moving it about But if you use a perforator (*trepan*²), you must not penetrate to the membrane, if you operate on a case which you have had the charge of from the first, but must leave a thin scale of bone, as described in the process of sawing



On the Surgery

IT IS the business of the physician to know, in the first place, things similar and things dissimilar, those connected with things most important, most easily known, and in anywise known,¹ which are to be seen, touched, and heard, which are to be perceived in the sight, and the touch, and the hearing, and the nose, and the tongue, and the understanding, which are to be known by all the means we know other things

2 The things relating to surgery, are—the patient, the operator, the assistants, the instruments, the light, where and how, how many things, and how, where the body, and the instruments, the time, the manner, the place

3 The operator is either sitting or standing, conveniently for himself, for the person operated upon, for the light. There are two kinds of light, the common and the artificial, the common is not at our disposal, the artificial is at our disposal. There are two modes of using each, either to the light, or from the light (to the side?) There is little use of that which is from (or oblique to the light), and the degree of it is obvious. As to opposite the light, we must turn the part to be operated upon to that which is most brilliant of present and convenient lights, unless those parts which should be concealed, and which it is a shame to look upon, thus the part that is operated upon should be opposite the light, and the operator opposite the part operated

¹ The meaning of the first clause of this sentence, according to Glanville, is, that the first thing which the medical practitioner must do is to make himself well acquainted with semeiology, by comparing carefully the condition of a sense with that of the body. In cases of accident, it was the practice of the ancient surgeons to compare the condition of the injured part with its fellow or corresponding part on the opposite side.

upon, except in so far as he does not stand in his own light, for in this case the operator will indeed see, but the thing operated upon will not be seen. With regard to himself when sitting, his feet should be raised to a direct line with his knees, and nearly in contact with one another, the knees a little higher than the groins, and at some distance from one another, for the elbows to rest upon them. The robe, in a neat and orderly manner, is to be thrown over the elbows and shoulders equally and proportionally. With regard to the part operated upon, we have to consider how far distant, and how near, above, below, on this side, on that side, or in the middle. The measure as to distance and proximity is, that the elbows do not press the knees before, nor the sides behind, that the hands be not raised higher than the breasts, nor lower than so as that when the breast reposes on the knees he may have the hands at right angles with the arm thus it is as regards the medium, but as concerns this side or that, the operator must not be beyond his seat, but in proportion as he may require turning he must shift the body, or part of the body, that is operated upon. When standing, he must make his inspection, resting firmly and equally on both feet, but he must operate while supporting himself upon either leg, and not the one on the same side with the hand which he makes use of, the knee being raised to the height of the groins as while sitting, and the other measures in like manner. The person operated upon should accommodate the operator with regard to the other parts of his body, either standing, sitting, or lying, so as that he may continue to preserve his figure, avoid sinking down, shrinking from, turning away, and may maintain the figure and position of the part operated upon, during the act of presentation, during the operation, and in the subsequent position.

4 The nails should be neither longer nor shorter than the points of the fingers, and the surgeon should practice with the extremities of the fingers, the index-finger being usually turned to the thumb, when using the entire hand, it should be prone, when both hands, they should be opposed to one another. It greatly promotes a dexterous use of the fingers when the space between them is large, and when the thumb is opposed to the

index But it is clearly a disease when the thumb is impaired from birth, or when, from a habit contracted during the time of nursing, it is impeded in its motions by the fingers One should practice all sorts of work with either of them, and with both together (for they are both alike), endeavoring to do them well, elegantly, quickly, without trouble, neatly, and promptly

5 The instruments, and when and how they should be prepared, will be treated of afterwards, so that they may not impede the work, and that there may be no difficulty in taking hold of them, with the part of the body which operates But if another gives them, he must be ready a little beforehand, and do as you direct

6 Those about the patient must present the part to be operated upon as may seem proper, and they must hold the rest of the body steady, in silence, and listening to the commands of the operator

7 There are two views of bandaging that which regards it while doing, and that which regards it when done It should be done quickly, without pain, with ease, and with elegance, quickly, by despatching the work, without pain, by being readily done, with ease, by being prepared for everything, and with elegance, so that it may be agreeable to the sight By what mode of training these accomplishments are to be acquired has been stated When done, it should fit well and neatly, it is neatly done when with judgment, and when it is equal and unequal, according as the parts are equal or unequal The forms of it (the bandage?) are the simple, the slightly winding (called *ascia*), the sloping (*sima*), the *monoculus*, the *rhombus*, and the *semi-rhombus* The form of bandage should be suitable to the form and the affection of the part to which it is applied

8 There are two useful purposes to be fulfilled by bandaging (*first*), strength, which is imparted by the compression and the number of folds In one case the bandage effects the cure, and in another it contributes to the cure For these purposes this is the rule—that the force of the constriction be such as to prevent the adjoining parts from separating, without compressing them much, and so that the parts may be adjusted but not

forced together, and that the constriction be small at the extremities, and least of all in the middle. The knot and the thread that is passed through should not be in a downward but in an upward direction, regard being had to the circumstances under which the case is presented, to position, to the bandaging, and to the compression. The commencement of the ligatures is not to be placed at the wound, but where the knot is situated. The knot should not be placed where it will be exposed to friction, nor where it will be in the way, nor where it will be useless. The knot and the thread should be soft, and not large.

9 (*Second*) One ought to be well aware that every bandage has a tendency to fall off towards the part that declines or becomes smaller, as, for example, upwards, in the case of the head, and downwards, in the case of the leg. The turns of the bandage should be made from right to left, and from left to right, except on the head, where it should be in a straight direction. When opposite parts are to be bandaged together, we must use a bandage with two heads, or if we make use of a bandage with one head, we must attach it in like manner at some fixed point, such, for example, as the middle of the head, and so in other cases. Those parts which are much exposed to motion, such as the joints, where there is a flexion, should have few and slight bandages applied to them, as at the ham, but where there is much extension, the bandage should be single and broad, as at the kneepan, and for the maintenance of the bandage in its proper place, some turns should be carried to those parts which are not much moved, and are lank, such as the parts above and below the knee. In the case of the shoulder, a fold should be carried round by the other armpit, in that of the groin, by the flanks of the opposite side, and of the leg, to above the calf of the leg. When the bandage has a tendency to escape above, it should be secured below, and *vice versa*, and where there is no means of doing this, as in the case of the head, the turns are to be made mostly on the most level part of the head, and the folds are to be done with as little obliquity as possible, so that the firmest part being last applied may secure the portions which are more movable. When we cannot secure the bandaging by means of

folds of the cloth, nor by suspending them from the opposite side, we must have recourse to stitching it with ligatures, either passed circularly or in the form of a seam

10 The bandages should be clean, light, soft, and thin One should practice rolling with both hands together, and with either separately. One should also choose a suitable one, according to the breadth and thickness of the parts The heads of the bandages should be hard, smooth, and neatly put on That sort of bandaging is the worst which quickly falls off, but those are bad bandages which neither compress nor yet come off

11. The following are the object which the upper bandage, the under bandage, or both aim at. The object of the under bandage is either to bring together parts that are separated, or to compress such as are expanded, or to separate what are contracted, or to restore to shape what are distorted, or the contrary It is necessary to prepare pieces of linen cloth, which are light, thin, soft, clean, having no seams nor protuberances on them, but sound, and able to bear some stretching, or even a little more than required, not dry, but wetted with a juice suitable to the purpose required We must deal with parts separated (*in a sinus*²) in such wise, that the parts which are raised may touch the bottom without producing pressure, we must begin on the sound part, and terminate at the wound, so that whatever humor is in it may be expelled, and that it may be prevented from collecting more And straight parts are to be bandaged in a straight direction, and oblique obliquely, in such a position as to create no pain, and so that there may be no constriction nor falling off on a change of position, either for the purpose of taking hold of anything, or laying the limb, and that muscles, veins, nerves, and bones may be properly placed and adjusted to one another It should be raised or laid in a natural position, so as not to occasion pain In those cases in which an abscess is formed, we must act in a contrary way. When our object is to bring together parts which have become expanded, in other respects we must proceed on the same plan, and we must commence the bringing together from some considerable distance, and after their approach, we must apply compression, at first slight,

and afterwards stronger, the limit of it being the actual contact of the parts In order to separate parts which are drawn together, when attended with inflammation, we must proceed on the opposite plan, but when without inflammation, we must use the same preparations, but bandage in the opposite direction In order to rectify distorted parts, we must proceed otherwise on the same principles, but the parts which are separated must be brought together by an under bandage, by agglutinants, and by suspending it (*the limb?*) in its natural position And when the deformities are the contrary, this is to be done on the contrary plan

12 In fractures we must attend to the length, breadth, thickness, and number of the compresses The length should be that of the bandaging, the breadth, three or four fingers, thickness, three or fourfold, number so as to encircle the limb, neither more nor less, those applied for the purpose of rectifying a deformity, should be of such a length as to encircle it, the breadth and thickness being determined by the vacuity, which is not to be filled up at once The upper bandages are two, the first of which is to be carried from the seat of the injury upwards, and the second from the seat of the injury downwards, and from below upwards, the parts about the seat of the injury being most compressed, the extremities least, and the rest in proportion The upper bandages should take in a considerable portion of the sound parts We must attend to the number, length, and breadth of the bandages, the number must be such as not to be inferior to what the injury requires, nor occasion compression with the splints, nor prove cumbersome, nor occasion any slipping of them, nor render them inefficient As to length and breadth, they should be three, four, five, or six cubits in length, and as many fingers broad The folds of the strings (*selvages?*) should be such as not to occasion pressure, they are to be soft and not thick, and all these things are to be proportionate to the length, breadth, and thickness of the part affected The splints are to be smooth, even, and rounded at the extremities, somewhat less all along than the upper bandaging, and thickest at the part to which the fracture inclines Those parts where there are tuber-

osities, and which are devoid of flesh, such as the ankles or fingers, we must guard from the splints which are placed over them, either by position, or by their shortness. They are to be secured by the strings in such a manner as not to occasion pressure at first. A soft, consistent, and clean cerate should be rubbed into the folds of the bandage.

13 As to the temperature and quantity of the water used, its heat should be just such as the hand can bear, and it ought to be known that a large quantity is best for producing relaxation and attenuation, whereas a moderate quantity is best for incarnating and softening. The limit to the affusion is, to stop when the parts become swelled up, and before the swelling subsides, for the parts swell up at first, and fall afterward.

14 The object on which it (*the limb?*) is laid should be soft, smooth, and sloping upwards toward the protuberant parts of the body, such as the heel or hips, so that there may be no projection, nor bending inwards, nor turning aside. The canal (*spout or gutter?*) should rather comprehend the whole limb than the half of it, attention being paid to the injury and to whatever else appears to create inconvenience.

15 The presentation of the injured part to the physician, the extension, the arrangement, and so forth, are to be regulated according to nature. What is nature in these operations is to be determined by the accomplishment of the object which we have in view, and for this purpose we must look to the part in the state of rest, in its middle state, and to habit, in regard to the state of rest and relaxation, as in the arm, that it be in a line with the hand, and with regard to the medium between flexion and extension, that the forearm be at right angle to the arm, and with regard to habit, it should be considered that some limbs bear certain positions preferably, as, for example, the thighs extension, for in such attitudes the parts can best bear to be placed for a considerable time without a change of posture. And in the change from the state of dissection, the muscles, veins, nerves, and bones, when properly arranged and secured, will preserve their relations to one another while the limb is raised or placed.

16 The extension should be most powerful when the largest and thickest bones, or when both are broken, next when the under-bone, and least of all, when the upper When immoderate, it is injurious, except in the case of children The limb should be a little elevated The model by which we judge if the part be properly set is the sound part of the same name, or the part which is its pair

17 Friction can relax, brace, incarnate, attenuate hard braces, soft relaxes, much attenuates, and moderate thickens

18 The following should be the state of matters on the first application of the bandage The person to whom it has been applied should say that he feels the compression particularly at the seat of the injury, but very little at the extremities, the parts should be adjusted but not pressed together, and that rather by the number of the bandages than by the force of the constriction, and the tightness should rather be on the increase during the first day and night, but on the next it should be less, and on the third the bandages should be loose On the next day a soft swelling should be observed in the extremities, and on the third day, when the bandaging is loosed, the swelling should be found diminished in size, and this should be the case every time the bandages are removed At the second application of the bandage, it should be ascertained whether the dressing has been properly done, and then greater compression should be made, and with more bandages, and on the third, still greater, and still more On the seventh day from the first dressing, when the bandages are loosed, the limb should be found slender and the bones mobile We must then have recourse to the splints, provided the limb be free of swelling, pruritus, and ulceration, and allow them to remain until twenty days after the accident, but if any suspicions arise, the bandages must be loosed in the interval The splints should be tightened every third day

19 The suspending of a fractured limb in a sling, the disposition of it, and the bandaging, all have for their object to preserve it in position The principal considerations with regard to the position are the habits and the peculiar nature of each

of the limbs the varieties are shown in running, walking, standing, lying, action, repose

20 It should be kept in mind that exercise strengthens, and inactivity wastes

21 Compression should be produced by the number of bandages, rather than by the force of the constriction

22 In cases of ecchymosis, contusions, sprains, or swellings not attended with inflammations, blood is to be expelled from the wound, in greatest quantity to the upper part, and in smallest to the inferior, neither the arm nor the leg should be placed in a declining position. the head of the bandage should be placed on the wound, and there the greatest pressure should be made, the least at the extremities, and intermediately in the middle, the last fold of the bandage should be at the upper part of the body. As to binding and compression, these objects are to be attained rather by the number of the bandages than the force of the constriction, and moreover, in these cases the bandages should be thin, light, soft, clean, broad, sound, so that they may effect their purpose, even without splints. And we must use affusions

23 Dislocations, sprains, diastases of bones, violent separation, abruption of the extremities of bones, and distrainings, so as to induce *varus* or *valgus*, in these cases we must apply the bandages so as not to compress the part whence the displacement took place, and that we may render them tight at the side to which the displacement was, and give the limb an inclination in the opposite direction, and that in an excessive degree. We employ bandages, compresses, suspension of the limb in a sling, attitude, extention, friction, rectification, and along with these the affusion of much water

24 In treating parts which are atrophied, we must comprehend a considerable part of the sound limb with the bandage, so that by the influx thereby produced, the wasted part may acquire a supply greater than its loss, and may be thus disposed to growth and restoration of its fleshy parts. It is better also to bandage the parts above, as the thigh in the case of the leg,

and also the thigh and leg of the opposite side, so that they may be placed in similar circumstances, and may both equally be deprived of motion, and that the supply of nourishment may be alike curtailed and open to both. The compression should be the effect rather of the number of the bandages than of their tightness. We relax first the part most requiring it, and have recourse to that kind of friction which will promote the growth of flesh, and to affusion. No splints.

25 Those things which are for the purpose of giving support and strength to the part, as to the breast, side, head, and so forth, are used in such cases as the following for pulsations, that there may be no motion in the part, and in separation at the sutures of the skull, in order to give support, and in order to strengthen the chest and head, in coughs, sneezings, and other movements. In all these cases the same measure of bandaging is to be observed, for where the injury is, there the bandage should compress most, and something soft is to be placed below that suits with the complaint, and we must not apply the bandages tighter than just to stop the pulsations from creating disturbance, and that the separated parts at the sutures may be brought into contact, they must not be such as absolutely to stop the coughs and sneezings, but so as to give support, and, without occasioning uneasiness, prevent the parts from being shaken.



On Fractures

IN TREATING fractures and dislocations, the physician must make the extension as straight as possible, for this is the most natural direction. But if it incline to either side, it should rather turn to that of pronation, for there is thus less harm than if it be toward supination. Those, then, who act in such cases without deliberation, for the most part do not fall into any great mistake, for the person who is to have his arm bound, presents it in the proper position from necessity, but physicians who fancy themselves learned in these matters, are they who commit blunders. There is no necessity for much study, then, in order to set a broken arm, and in a word, any ordinary physician can perform it, but I am under the necessity of giving the longer directions on this subject, because I know physicians who have the reputation of being skilled in giving the proper positions to the arm in binding it up, while in reality they are only showing their own ignorance. But many other things in our art are judged of in this manner, for people rather admire what is new, although they do not know whether it be proper or not, than what they are accustomed to, and know already to be proper, and what is strange, they prefer to what is obvious. I must now state what the mistakes of medical men are, which I wish to unteach, and what instructions I have to give as to the management of the arm, for what I have to say regarding it, will apply to the other bones in the body.

2 The arm, then, for that is the subject we were treating of, was presented in the prone position to be bound, but the physician forced his patient to hold it as the archers do when they project the shoulder, and in this position he bound it up, thinking within

himself that he was acting according to Nature, and in proof of this he pointed out that all the bones in the fore-arm were thus in a straight line, and that the integuments both inside and outside, were also in a straight line, and that the flesh and nerves (*tendons*?) were thus put in their natural position, and he appealed to what happens in archery, as a proof of this. And so saying, and so doing, he is looked up to as a sage, and yet he forgets that in all the other arts and performances, whether executed by strength or dexterity, what is reckoned the natural position is not the same, and that in the same piece of work it may happen that the natural position of the right arm is not the same as that of the left. For there is one attitude in throwing the javelin, and another in slinging, another in casting stones, another in boxing, and another in a state of repose. And whatever arts one examines, it will be found that the natural position of the arms is not the same in each, but that in every case the arms are put into the attitude which suits best with the instrument that is used, and the work to be performed. In practicing archery, no doubt this is the best attitude of the left arm, for the ginglymoid extremity of the humerus being fixed in the cavity of the ulna, in this position, throws the bones of the fore-arm and arm into a line, as if they constituted a single bone, and all flexion at the joint is prevented in this position. It is no doubt certain that the member is thus put into the most unbending and extended position possible, so as not to be overcome or yield when the string is drawn by the right arm, and thus will the archer be enabled to draw the string farthest, and discharge his arrow with the greatest force and rapidity, for arrows thus discharged have the greatest swiftness and force, and are carried to the greatest distances. But there is nothing in common between the binding up of an arm and archery. Moreover, if having thus bound up the arm, the physician direct the patient to keep it thus, he will occasion him greater pain than he had from the wound itself, and thus also, if the physician order him to bend the arm, neither the bones, the nerves, nor the flesh will any longer be in the same condition, but will be arranged differently, having overcome the bandaging. What use, then, is there of the archer's attitude?

And these mistakes, the physician, conceited in his knowledge, would probably not have committed if he had allowed the patient himself to present his arm

3 But another physician putting the arm into the state of supination, gives orders to extend the arm thus, and bandages it in this position, reckoning it the one according to nature, judging thus from the skin, and also fancying the bones to be thus in their natural position, because the bone which protrudes at the wrist, where the little finger is, appears to be in a line with the bone from which people measure the bone of the fore-arm. These things he brings forward as proofs that the parts are in their natural state, and he is supposed to speak correctly. But, indeed, if the arm be kept stretched in a supine position, it will become very painful, and this fact any one may ascertain by extending his own arm in this attitude. And also a weaker man grasping with his hands a stronger man whose arm is turned in a supine position, could lead him wherever he chose, and neither, if a man held a sword thus in his hand, could he make any proper use of it, so constrained is this position. And, moreover, if, when a physician has thus bound up the arm, he allow it to remain in the same position, the patient will endure greater pain if he walk about, but considerable, even if he remain at rest. And thus, too, if he shall bend the arm, the muscles and the bones must necessarily assume a different position. But, in addition to other mischief, he is ignorant of these facts regarding the position, that the bone which protrudes at the wrist, close to the little finger, belongs to the fore-arm, whereas the one at the joint, from which people measure the fore-arm, is the head of the humerus. He fancies that both these belong to the same bone, and many others are of this opinion. The latter, in fact, is the same part as that which is called the elbow, upon which we sometimes rest, and when he holds the arm thus in a supine position, in the first place the bone appears distorted, and in the next place the tendons which extend from the carpus along the inner side and from the fingers become distorted while the arm has a supine position, for these tendons proceed to the bone of the humerus, from which the fore-arm is measured. Such, and so

many mistakes and marks of ignorance are committed, regarding the natural construction of the arm. But if one will extend a broken arm as I direct, he will turn the bone, situated at the extremity of the little finger, into the straight line, and also the one at the elbow, and the tendons which stretch from the carpus to the extremity of the humerus will be placed in the straight line, and when the arm is suspended in a sling, it will be in the same attitude as that in which it was bound up, and will give no pain to the patient when he walks about, nor when he lies reclined, and will not become fatigued. The man should be so seated that the prominent part of the bone may be turned to the brightest light which is at hand, so that the operator in making the extension, may be at no loss to discover if it be sufficiently straight. The prominence of a broken bone could not escape being detected by the hand of an experienced person, when applied for this purpose, and, moreover, the projecting part is particularly painful to the touch.

4 In cases of fracture in either of the bones of the forearm, it is easier to effect a cure if the upper bone be broken, although it be the thicker one, both because the sound bone is situated below, and forms a support to it, and because the deformity is more easily concealed, there being a thick mass of flesh on the upper side, except near to the wrist. But the lower bone is without a covering of flesh, is not easily concealed, and requires stronger extension. If it is not this bone, but the other which is broken, a more feeble extension proves sufficient, but if both be broken, a more powerful extension is required. In the case of a young person I have known the extension made more strong than was necessary, but in general the extension made is less than what is required. And when they are extended, the physician should apply the palms of the hands, and adjust the fractured parts and then having rubbed the parts with cerate, but not in large quantity, so that the bandages may not come off, it is to be bound up in this state, care being taken that the hand be not lower than the elbow, but a little higher, so that the blood do not flow toward the extremity, but may be determined to the upper part, and then it is to be secured with the bandage,

the head of which is to be placed at the fracture, and the bandage should impart firmness to the parts without occasioning strong compression. When you have carried the bandage twice or thrice round at the seat of the fracture, it is to be carried upward, so that the afflux of blood into it may be stopped, and the bandage should terminate there, and the first bandages ought not to be long. The head of the second bandage is also to be placed upon the seat of the fracture, and a single round of it being made there, it is then to be carried downward, and is not to be applied so tight as the other, and there should be greater distances between the turns, so that the bandage may prove sufficient to revert to the spot where the other terminated. The bandages may be rolled to the left hand or to the right, or to whatever side suits best with the position of the fractured arm, or according to the inclination which it may have. Afterward we must place along the arm, compresses, smeared with a little cerate, for thus they occasion less uneasiness, and are more easily arranged. And then we must apply the bandages crossways, sometimes to the right hand, and sometimes to the left, for the most part beginning below and terminating above, but sometimes commencing above and ending below. The parts which are thinly covered with flesh should be wrapped round with compresses, and inequalities should be made up, not by a number of folds at once, but by degrees. Some slack turns are also to be made around the wrist, to this side and to that. These two bandages are sufficient at first.

5 And these are the signs that the patient has been well treated and properly bandaged. If you ask him if the arm feels tight, and he says it does, but moderately so, and especially about the fracture, and this reply he should make all along, if the bandage be properly applied. And these are symptoms of the bandaging being moderately tight, if for the first day and night he fancies that the tightness does not diminish, but rather increases, and if on the next day there be a soft swelling in the hand, for this is a sign of moderate compression, but at the end of the second day the compression should feel less, and on the third day the bandaging should appear loose. And if any of

these symptoms be wanting, you may conclude that the bandaging is slacker than it should be, or if any of these symptoms be in excess, you may infer that the compression is more than moderate, and judging from these, you will apply the next bandages either slacker or tighter. Having removed the bandages on the third day, you must make extension and adjust the fracture, and bind it up again, and if the first bandaging was moderately applied, the second bandaging should be made somewhat tighter. The heads of the bandages should be placed on the fractures as in the former case, for, by so doing, the humors will be driven to the extremities, whereas if you bandage any other part beforehand, the humors will be forced from it to the seat of the fracture. It is of much importance that this should be properly understood. Thus the bandaging and compression should always commence at the seat of the fracture, and everything else should be conducted on the same principle, so that the farther you proceed from the fracture, the compression should always be the less. The bandages should never be actually loose, but should be smoothly put on. At each dressing the number of bandages should be increased, and the patient, if asked, should answer, that he feels the bandages somewhat tighter than on the former occasion, especially about the fracture, and everything else in proportion, and with respect to the swelling, the pain, and recovery, everything should proceed as after the former dressing. But on the third day the outer bandaging should appear looser. Then having removed the bandages, you should bind it up again, somewhat tighter than before, and with all the bandages which will be required on the occasion, and afterwards one ought to experience the same train of symptoms as at the former periods of bandaging.

6 When the third day arrives, that is to say, the seventh from the first dressing, if properly done, the swelling in the hand should be not very great, and the part which has been bandaged should be found more slender and less swelled at each time, and on the seventh day the swelling should be quite gone, and the broken bones should be more readily moved, and admit of being easily adjusted. And if these things be so, you should,

after setting the fracture, apply the bandages so as to suit the splints, and a little more tight than formerly, unless there be more pain from the swelling in the hand. When you have applied the bandages, you must adjust the splints all around the limb, and secure them with strings so loose as just to keep them in their place, without the application of the splints contributing at all to the compression of the arm. After this the pain and recovery should proceed as in the preceding periods of the bandaging. But if, on the third day, the patient say that the bandaging is loose, you must then fasten the splints, especially at the fracture, but also elsewhere, wherever the bandaging is rather loose than tight. The splint should be thickest where the fracture protrudes, but it should not be much more so than elsewhere. Particular attention should be paid to the line of the arm corresponding to the thumb, so that no splint be laid on it, but upon each side of it, nor in the line of the little finger where the bone is prominent at the wrist, but on each side of it. And if it be found necessary that splints should be applied in these directions at the seat of the fracture, they should be made shorter than the others, so as that they may not reach the bones which are prominent at the wrist, for otherwise there is danger of ulceration, and of the tendons being laid bare. The splints should be adjusted anew every third day, in a very gentle manner, always keeping in mind that the object of the splints is to maintain the lower bandages in their place, and that they are not needed in order to contribute to the compression.

7 If, then, you see that the bones are properly adjusted by the first dressings, and that there is no troublesome pruritus in the part, nor any reason to suspect ulceration, you may allow the arm to remain bandaged in the splints until after the lapse of more than twenty days. The bones of the fore-arm generally get consolidated in thirty days altogether, but there is nothing precise in this matter, for one constitution differs from another, and one period of life from another. When you remove the bandages, you must pour hot water on the arm and bind it up again, but somewhat slacker, and with fewer bandages than formerly. And again on the third day you undo the bandages, and

bind it still more loosely, and with still fewer bandages And if, while the arm is bound up in the splints, you should at any time suspect that the bones do not lie properly, or if anything about the bandages annoys the patient, you should loose them at the middle of the time, or a little earlier, and apply them again A diet slightly restricted will be sufficient in those cases in which there was no external wound at first, or when the bone does not protrude, but one should live rather sparingly until the tenth day, as being now deprived of exercise, and tender articles of food should be used, such as moderately loosen the bowels, but one should abstain altogether from flesh and wine, and then by degrees resume a more nourishing diet This doctrine may be laid down as a just rule in the treatment of fractures, both as to how they should be treated, and what will be the results of a proper plan of treatment, so that one may know, that if things do not turn out thus, there has been some defect or excess in the treatment And in this simple plan of treatment it is necessary to attend also to the following directions, which some physicians pay little attention to, although, when improperly executed, they are capable of marring the whole process of bandaging for if both the bones be broken, or the lower one only, and the patient who has got his arm bandaged keep it slung in a shawl, and that the shawl is particularly loose at the fracture, so that the arm is not properly suspended at this end or that, in this case the bone must necessarily be found distorted upwards, whereas, when both bones are thus broken, if the arm recline in the shawl at the wrist and elbow, but the rest of it be not kept up, the bone in this case will be distorted to the lower side The greater part of the arm and the wrist of the hand should therefore be equally suspended in a broad soft shawl

8 When the arm is broken, if one stretch the fore-arm and adjust it while in this position, the muscle of the arm will be bound while extended, but when the dressing is over, and the patient bends his arm at the elbow, the muscle of the arm will assume a different shape The following, then, is the most natural plan of setting the arm having got a piece of wood a cubit or somewhat less in length, like the handles of spades,

suspend it by means of a chain fastened to its extremities at both ends, and having seated the man on some high object, the arm is to be brought over, so that the armpit may rest on the piece of wood, and the man can scarcely touch the seat, being almost suspended, then having brought another seat, and placed one or more leather pillows under the arm, so as to keep it a moderate height while it is bent at a right angle, the best plan is to put round the arm a broad and soft skin, or broad shawl, and to hang some great weight to it, so as to produce moderate extension, or otherwise, while the arm is in the position I have described, a strong man is to take hold of it at the elbow and pull it downward. But the physician standing erect, must perform the proper manipulation, having the one foot on some pretty high object, and adjusting the bone with the palms of his hands, and it will readily be adjusted, for the extension is good if properly applied. Then let him bind the arm, commencing at the fracture, and do otherwise as directed above, let him put the same questions and avail himself of the same signs to ascertain whether the arm be moderately tight or not, and every third day let him bind it anew and make it tighter, and on the seventh or ninth day let him bind it up with splints, and leave it so until after the lapse of more than thirty days. And if he suspect that the bone is not lying properly, let him remove the bandages in the interval, and having adjusted the arm, let him bind it up again. The bone of the arm is generally consolidated in forty days. When these are past, the dressing is to be removed, and fewer and slacker bandages applied instead of it. The patient is to be kept on a stricter diet, and for a longer space of time than in the former case, and we must form our judgment of it from the swelling in the hand, looking also to the strength of the patient. This also should be known, that the arm is naturally inclined outward, to this side, therefore, the distortion usually takes place, if not properly treated, but indeed, all the other bones are usually distorted during treatment for fracture to that side to which they naturally incline. When, therefore, anything of this kind is suspected, the arm is to be encircled in a broad shawl, which is to be carried round the

breast, and when the patient goes to rest, a compress of many folds, or some such thing, is to be folded and placed between the elbow and the side, for thus the bending of the bone will be rectified, but care must be taken lest it be inclined too much inwards

9 The human foot is composed of several small bones like the hand. These bones therefore are scarcely ever broken, unless the skin at the same time be wounded by some sharp and heavy body. The treatment of such injuries, therefore, will be delivered under the head of wounds. But if any bone be moved from its place, or a joint of the toes be luxated, or any of the bones of the part called the tarsus be displaced, it must be forced back again to its place as described with regard to the hand, and is to be treated with cerate, compresses, and bandages, like the fractures, with the exception of the splints, and is to be secured tightly in the same way, and the bandages renewed on the third day, and the patient thus bandaged should return the same answers as in fractures, as to the bandages feeling tight or slack. All these bones recover perfectly in twenty days, except those that are connected with the bones of the leg, and are in a line with them. It is advantageous to lie in bed during the whole of this time, but the patients, thinking light of the complaint, have not perseverance to do this, and they walk about before they get well, wherefore many of these do not make a perfect recovery. And often the pain puts them in mind of the injury, and deservedly, for the feet sustain the weight of the whole body. When, therefore, they walk about before they are whole, the joints which have been luxated are cured incompletely, and, on that account, while walking about, they have pains in the leg from time to time.

10 But those bones which are connected with the bones of the leg are larger than the others, and the cure of them when luxated is more protracted. The mode of treatment then is the same, but we must use more bandages and more splints, and the bandage is to be carried round to this side and to that, and pressure is to be made as in the other cases, particularly at the seat of the luxation, and the first circles of the bandages are

to be made there And at each time the bandages are taken off, much hot water is to be used, for in all injuries at joints the affusion of hot water in large quantity is to be had recourse to And the same symptoms of compression and relaxation should manifest themselves in the same times, as in the cases formerly treated of, and the subsequent bandagings should be conducted in like manner These cases get completely well for the most part in forty days, if the patients have resolution to keep their bed, but if not, they are subjected to the complaints formerly described, or still worse

11 In persons who jumping from any high object pitch upon their heel with great force, the bones are separated, and the veins pour forth their contents, owing to the contusion of the flesh surrounding the bone, and hence a swelling and much pain supervene For this bone (*os calcis*) is not a small one, protrudes beyond the line of the leg, and is connected with important veins and tendons, for the back tendon of the leg is inserted into this bone Such cases are to be treated with cerate, and with compresses and bandages, and hot water is to be used in large quantity, and they require many bandages, which ought to be particularly good and appropriate And if the patient happen to have a tender skin about the heel, nothing is to be done to it, but if, as some have it, the skin be thick and hardened, it is to be pared down smoothly and thinned, but without wounding it It is not everybody who can apply the bandage properly in such cases, for if one shall bind the parts, as in other accidents about the ankle, sometimes bringing a fold round the foot and sometimes round the tendon, these turns leave out the heel, which is the seat of the contusion, and thus there is danger that the *os calcis* may sphacelate, and if this should take place, the impediment may endure for life and also in all the other cases of sphacelus, not proceeding from such a cause as this, as when, from being carelessly allowed to lie in a certain position during confinement to bed, the heel becomes black, or when a serious wound has occurred in the leg and it is long of healing, and is connected with the heel, or when the same thing happens in the thigh, or when in any disease a protracted decubitus takes place

on the back, in all such cases the sores are inveterate, troublesome, and frequently break out again, unless particular attention be paid to the cure, along with much rest, as in all the cases attended with sphacelus. And cases of sphacelus connected with this cause, in addition to other inconveniences, are attended with great danger to the whole body. For they are apt to be attended with very acute fevers, of the continual type, accompanied with tremblings, hiccup, aberration of intellect, and which prove fatal within a few days and there may be lividities of bloody veins,¹ with nausea, and gangrene from pressure, these diseases may occur, besides the sphacelus.² Those which have been described are the most violent contusion, but in general the contusions are mild, and no great care is required with regard to the treatment, and yet it must be conducted properly. But when the contusion appears to be severe, we must do as described above, making many turns of the bandage around the heel, sometimes carrying it to the extremity of the foot, sometimes to the middle, and sometimes around the leg, and, in addition, all the surrounding parts are to be bandaged in this direction and that, as formerly described, and the compression should not be made strong, but we should make use of many bandages, and it is better also to administer hellebore the same day or on the morrow, and the bandages should be removed on the third day and re-applied. And these are the symptoms by which we discover whether the case will get worse or not when the extravasated blood, the lividities, and the surrounding parts become red and hard, there is danger of an exacerbation. But if there be no fever, we must give emetics, as has been said, and administer

¹ By bloody veins is meant veins of a large size, as Galen explains. Contusions of such necessarily produce extravasation and hemorrhage, and the other bad consequences described by our author.

² That gangrene should have often supervened in such a case, as described by our author, need not appear surprising. It shows that Hippocrates had a wonderful talent for original observation when he was able to detect and describe such a case, and it ought to teach our profession a lesson of humility, in comparing our present state of knowledge with that of our forefathers, when we thus find that the "old man of Cos," twenty-two centuries ago, understood the nature of this accident better than many of us did not many years since.

the other remedies which are applicable when the fever is not of a continual type, but if continual fever be present, we must not give strong medicines, but enjoin abstinence from solid food and soups, and give water for drink, and not allow wine but *oxyglyky* (a composition from vinegar and honey?) But if the case be not going to get worse, the ecchymosed and livid parts, and those surrounding them become greenish and not hard, for this is a satisfactory proof in all cases of ecchymosis, that they are not to get worse, but when lividity is complicated with hardness, there is danger that the part may become blackened And we must so manage the foot as that it may be generally raised a little higher than the rest of the body Such a patient will get well in sixty days if he keep quiet

12 The leg consists of two bones, of which the one is much more slender than the other at one part, but not much more slender at another These are connected together at the foot, and form a common epiphysis, but they are not united together along the line of the leg, and at the thigh they are united together and form an epiphysis, and this epiphysis has a diaphysis, but the other bone in a line with the little toe is a little longer Such is the nature of the bones of the leg.

13 Sometimes the bones connected with the foot are displaced, sometimes both bones with their epiphysis, sometimes the whole epiphysis is slightly moved, and sometimes the other bone These cases are less troublesome than the same accidents at the wrist, if the patients will have resolution to give them rest The mode of treatment is the same as that of the other, for the reduction is to be made, as of the other, by means of extension, but greater force is required, as the parts of the body concerned are stronger in this case But, for the most part, two men will be sufficient, by making extension in opposite directions, but, if they are not sufficiently strong, it is easy to make more powerful extension in the following way having fixed in the ground either the nave of a wheel, or any such object, something soft is to be bound round the foot, and then some broad thongs of ox-skin being brought round it, the heads of the thongs are to be fastened to a pestle or any other piece of wood, the end of

which is to be inserted into the nave, and it, the pestle, is to be pulled away, while other persons make counter-extension by grasping the shoulders and the ham. It is also sometimes necessary to secure the upper extremity otherwise, this if you desire to effect, fasten deeply in the ground a round, smooth piece of wood, and place the upper extremity of the piece of wood at the perineum, so that it may prevent the body from yielding to the pulling at the foot, and, moreover, to prevent the leg while stretched, from inclining downward, some person seated at his side should push back the hip, so that the body may not turn round with the pulling, and for this purpose, if you think fit, pieces of wood may be fastened about the armpits on each side, and they are to be stretched by the hands, and thus secured, while another person takes hold of the limb at the knee, and aids in thus making counter-extension. Or thus, if you prefer it having bound other thongs of leather about the limb, either at the knee, or around the thigh, and having fastened another nave of a wheel in the ground above the head, and adjusted the thongs to some piece of wood adapted to the nave, extension may thus be made in the opposite direction to the feet. Or if you choose, it may be done thus. Instead of the naves, lay a moderate-sized beam under the couch, and then having fastened pieces of wood in this beam, both before and behind the head, make counter-extension by means of thongs, or place windlasses at this extremity and that, and make extension by means of them. There are many other methods of making extension. But the best thing is, for any physician who practices in a large city, to have prepared a proper wooden machine, with all the mechanical powers applicable in cases of fractures and dislocation, either for making extension, or acting as a lever. For this purpose it will be sufficient to possess a board in length, breadth, and thickness, resembling the quadrangular threshing-boards made of oak.

14 When you have made proper extension, it is easy to reduce the joint, for the displaced bone is thus raised into a line with the other. And the bones are to be adjusted with the palms of the hands, pressing upon the projecting bone with the one, and making counter-pressure below the ankle with the other. When

you have replaced the bones, you must apply the bandages while the parts are upon the stretch, if you possibly can, but if prevented by the thongs, you must loose them, and make counter-extension until you get the bandages applied. The bandage is to be applied in the manner formerly described, the heads of the bandages being placed on the projecting part, and the first turns made in like manner, and so also with regard to the number of compresses and the compression, and turns of the bandages are to be brought frequently round on this and on that side of the ankle. But this joint must be bound more tight at the first dressing than in the case of the hand. But when you have applied the bandage, you must place the bandaged part somewhat higher than the rest of the body, and in such a position that the foot may hang as little as possible. The attenuation of the body is to be made proportionate to the magnitude of the luxation, for one luxation is to be a small, and another to a great extent. But in general we must reduce more, and for a longer time, in injuries about the legs, than in those about the hands, for the former parts are larger and thicker than the latter, and it is necessary that the body should be kept in a state of rest, and in a recumbent position. There is nothing to prevent or require the limb to be bandaged anew on the third day. And all the treatment otherwise is to be conducted in like manner, as in the preceding cases. And if the patient have resolution to lie quiet, forty days will be sufficient for this purpose, if only the bones be properly reduced, but if he will not lie quiet, he will not be able to use the limb with ease, and he will find it necessary to wear a bandage for a long time. When the bones are not properly replaced, but there has been some defect in this respect, the hip, the thigh, and the leg become wasted, and if the dislocation be inward, the external part of the thigh is wasted, and *vice versa*. But for the most part the dislocation is inward.

15 And when both bones of the leg are broken without a wound of the skin, stronger extension is required. We may make extension by some of the methods formerly described, provided the bones ride over one another to a considerable degree. But extension by men is also sufficient, and for the most part two

strong men will suffice, by making extension and counter-extension. Extension must naturally be made straight in a line with the leg and thigh, whether on account of a fracture of the bones of the leg or of the thigh. And in both cases they are to be bandaged while in a state of extension, for the same position does not suit with the leg and the arm. For when the fractured bones of the arm or fore-arm are bandaged, the fore-arm is suspended in a sling, and if you bind them up while extended, the figures of the fleshy parts will be changed in bending the arm at the elbow, for the elbow cannot be kept long extended, since persons are not in the custom of keeping the joint long in this form, but in a bent position, and persons who have been wounded in the arm, and are still able to walk about, require to have the arm bent at the elbow-joint. But the leg, both in walking and standing, is habitually extended, either completely or nearly so, and is usually in a depending position from its construction, and in order that it may bear the weight of the rest of the body. Wherefore it readily bears to be extended when necessary, and even when in bed the limb is often in this position. And when wounded, necessity subdues the understanding, since the patients become incapable of raising themselves up, so that they neither think of bending the limb nor of getting up erect, but remain lying in the same position. For these reasons, neither the same position nor the same mode of bandaging applies to the arm and to the leg. If, then, extension by means of men be sufficient, we should not have recourse to any useless contrivances, for it is absurd to employ mechanical means when not required, but if extension by men be not sufficient, you may use any of the mechanical powers which is suitable. When sufficiently extended, it will be easy to adjust the bones and bring them into their natural position, by straightening and arranging them with the palms of the hand.

16 When the parts are adjusted, you should apply the bandages while the limb is in a stretched position, making the first turns to the right or to the left, as may be most suitable, and the end of the bandage should be placed over the fracture, and the first turns made at that place, and then the bandage should be

carried up the leg, as described with regard to the other fractures. But the bandages should be broader and longer, and more numerous, in the case of the leg than in that of the arm. And when it is bandaged it should be laid upon some smooth and soft object, so that it may not be distorted to the one side or the other, and that there may be no protrusion of the bones either forward or backward, for this purpose nothing is more convenient than a cushion, or something similar, either of linen or wool, and not hard, it is to be made hollow along its middle, and placed below the limb. With regard to the canals (*gutters*?) usually placed below fractured legs, I am at a loss whether to advise that they should be used or not. For they certainly are beneficial, but not to the extent which those who use them suppose. For the canals do not preserve the leg at rest as they suppose, nor, when the rest of the body is turned to the one side or the other, does the canal prevent the leg from following, unless the patient himself pay attention, neither does the canal prevent the limb from being moved without the body to the one side or the other. And a board is an uncomfortable thing to have the limb laid upon, unless something soft be placed above it. But it is a very useful thing in making any subsequent arrangements of the bed and in going to stool. A limb then may be well and ill treated or without the canal. But the common people have more confidence, and the surgeon is more likely to escape blame, when the canal is placed under the limb, although it is not *secundum artem*. For the limb should by all means lie straight upon some level and soft object, since the bandaging must necessarily be overcome by any distortion in the placing of the leg, whenever or to whatever extent it may be inclined. The patient, when bandaged, should return the same answers as formerly stated, for the bandaging should be the same, and the same swellings should arise in the extremities, and the slackening of the bandages in like manner, and the new bandaging on the third day, and the bandaged part should be found reduced in swelling, and the new bandagings should be more tightly put on, and more pieces of cloth should be used, and the bandages should be carried loosely about the foot, unless the wound be near the

knee Extension should be made and the bones adjusted at every new bandaging, for, if properly treated, and if the swelling progress in a suitable manner, the bandaged limb will have become more slender and attenuated, and the bones will be more mobile, and yield more readily to extension. On the seventh, the ninth, or the eleventh day, the splints should be applied as described in treating of the other fractures Attention should be paid to the position of the splints about the ankles and along the tendon of the foot which runs up the leg The bones of the leg get consolidated in forty days, if properly treated But if you suspect that anything is wanting to the proper arrangement of the limb, or dread any ulceration, you should loose the bandages in the interval, and having put everything right, apply them again

17 But if the other bone (*fibula*?) of the leg be broken, less powerful extension is required, and yet it must not be neglected, nor be performed slovenly, more especially at the first bandaging For in all cases of fracture this object should be attained then as quickly as possible For when the bandage is applied tight while the bones are not properly arranged, the part becomes more painful The treatment otherwise is the same

18 Of the bones of the leg, the inner one, called the tibia, is the more troublesome to manage, and requires the greater extension, and if the broken bones are not properly arranged, it is impossible to conceal the distortion, for the bone is exposed and wholly uncovered with flesh, and it is much longer before patients can walk on the leg when this bone is broken But if the outer bone be broken, it causes much less trouble, and the deformity, when the bones are not properly set, is much more easily concealed, the bone being well covered with flesh, and the patients speedily get on foot, for it is the inner bone of the leg which supports the most of the weight of the body For along with the thigh, as being in a line with weight thrown upon the thigh, the inner bone has more work to sustain, inasmuch as it is the head of the thigh-bone which sustains the upper part of the body, and it is on the inner and not on the outer side of

the thigh, being in a line with the tibia, and the other half of the body approximates more to this line than to the external one, and at the same time the inner bone is larger than the outer, as in the fore-arm the bone in the line of the little finger is the slenderer and longer. But in the joint of the inferior extremity, the disposition of the longer bone is not alike, for the elbow and the ham are bent differently. For these reasons when the external bone is broken, the patients can soon walk about, but in fractures of the inner, it is a long time before they can walk.

19 When the thigh-bone is broken, particular pains should be taken with regard to the extension that it may not be insufficient, for when excessive, no great harm results from it. For, if one should bandage a limb while the extremities of the bone are separated to a distance from one another by the force of the extension, the bandaging will not keep them separate, and so the bones will come together again as soon as the persons stretching it let go their hold, for the fleshy parts (*muscles?*) being thick and strong, are more powerful than the bandaging, instead of being less so. In the case then which we are now treating of, nothing should be omitted in order that the parts may be properly distended and put in a straight line, for it is a great disgrace and an injury to exhibit a shortened thigh. For the arm, when shortened, might be concealed, and the mistake would not be great, but a shortened thigh-bone would exhibit the man maimed. For when the sound limb is placed beside it, being longer than the other, it exposes the mistake, and therefore it would be to the advantage of a person who would be improperly treated that both his legs should be broken, rather than either of them, for in this case the one would be of the same length as the other. When, then, proper extension has been made, you must adjust the parts with the palms of the hands, and bandage the limb in the manner formerly described, placing the hands of the bandages as was directed, and making the turns upward. And the patient should return the same answers to the same questions as formerly, should be pained and recover in like manner, and should have the bandaging

renewed in the same way, and the application of the splints should be the same. The thigh-bone is consolidated in fifty days.

20 But this also should be known, that the thigh-bone is curved rather to the outside than to the inside, and rather forward than backward, when not properly treated, then, the distortions are in these directions, and the bone is least covered with flesh at the same parts, so that the distortion cannot be concealed. If, therefore, you suspect anything of this kind, you should have recourse to the mechanical contrivances recommended in distortion of the arm. And a few turns of the bandage should be brought round by the hip and the loins, so that the groin and the articulation near the perineum may be included in the bandage, and moreover, it is expedient that the extremities of the splints should not do mischief by being placed on parts not covered with the bandages. The splints, in fact, should be carefully kept off the naked parts at both ends, and the arrangement of them should be so managed, as that they may not be placed on the natural protuberances of the bone at the knee-joint, nor on the tendon which is situated there.

21 The swellings which arise in the ham, at the foot, or in any other part from the pressure, should be well wrapped in unscoured and carded wool, washed with wine and oil, and anointed with cerate, before bandaging, and if the splints give pain they should be slackened. You may sooner reduce the swellings, by laying aside the splints, and applying plenty of bandages to them, beginning from below and rolling upward, for thus the swellings will be most speedily reduced, and the humors be propelled to the parts above the former bandages. But this form of bandaging must not be used unless there be danger of vesications or blackening in the swelling, and nothing of the kind occurs unless the fracture be bound too tight, or unless the limb be allowed to hang, or it be rubbed with the hand, or some other thing of an irritant nature be applied to the skin.

22 More injury than good results from placing below the thigh a canal which does not pass farther down than the ham,

for it neither prevents the body nor the leg from being moved without the thigh. And it creates uneasiness by being brought down to the ham, and has a tendency to produce what of all things should be avoided, namely, flexion at the knee, for this completely disturbs the bandages, and when the thigh and leg are bandaged, if one bend the limb at the knee, the muscles necessarily assume another shape, and the broken bones are also necessarily moved. Every endeavor then should be made to keep the ham extended. But it appears to me, that a canal which embraces the limb from the nates to the foot is of use. And moreover, a shawl should be put loosely round at the ham, along with the canal, as children are swathed in bed, and then, if the thigh-bone gets displaced either upward or to the side, it can be more easily kept in position by this means along with the canal. The canal then should be made so as to extend all along the limb or not used at all.

23 The extremity of the heel should be particularly attended to, so that it may be properly laid, both in fractures of the leg and of the thigh. For if the foot be placed in a dependent position, while the rest of the body is supported, the limb must present a curved appearance at the forepart of the leg, and if the heel be placed higher than is proper, and if the rest of the leg be rather too low, the bone at the forepart of the leg must present a hollow, more especially if the heel of the patient be naturally large. But all the bones get consolidated more slowly, if not laid properly, and if not kept steady in the same position, and in this case the callus is more feeble.

24 These things relate to cases in which there is fracture of the bones without protrusion of the same or wound of any other kind. In those cases in which the bones are simply broken across, and are not comminuted, but protrude, if reduced the same day or next, and secured in their place, and if there be no reason to anticipate that any splintered bones will come away, and in those in which the broken bones do not protrude, nor is the mode of fracture such that there is reason to expect the splinters will come out, some physicians heal the sores in a way which neither does much good nor harm, by means of a cleansing

application, applying pitch ointment, or some of the dressings for fresh wounds, or anything else which they are accustomed to do, and binding above them compresses wetted with wine, or greasy wool, or something else of the like nature And when the wounds become clean and are new healed, they endeavor to bind up the limb with plenty of bandages, and keep it straight with splints This treatment does some good, and never much harm The bones, however, can never be equally well restored to their place, but the part is a little more swelled than it should be, and the limb will be somewhat shortened, provided both bones either of the leg or fore-arm have been fractured

25 There are others who treat such cases at first with bandages, applying them on both sides of the seat of the injury, but omit them there, and leave the wound uncovered, and afterward they apply to the wound some cleansing medicine, and complete the dressing with compresses dipped in wine and greasy wool This plan of treatment is bad, and it is clear that those who adopt this mode of practice are guilty of great mistakes in other cases of fracture as well as these For it is a most important consideration to know in what manner the head of the bandage should be placed and at what part the greatest pressure should be, and what benefits would result from applying the end of the bandage and the pressure at the proper place, and what mischiefs would result from applying the head of the bandage and the pressure otherwise than at the proper place Wherefore it has been stated in the preceding part of the work what are the results of either, and the practice of medicine bears witness to the truth of it, for in a person thus bandaged, a swelling must necessarily arise on the wound For, if even a sound piece of skin were bandaged on either side, and a part were left in the middle, the part thus left unbandaged would become most swelled, and would assume a bad color, how then could it be that a wound would not suffer in like manner? The wound then must necessarily become discolored and its lips everted, the discharge will be ichorous and without pus, and the bones, which should not have got into a state of necrosis, exfoliate, and the wound gets into a throbbing and inflamed condition And they

are obliged to apply a cataplasma on account of the swelling, but this is an unsuitable application to parts which are bandaged on both sides, for a useless load is added to the throbbing which formerly existed in it. At last they loose the bandages when matters get very serious, and conduct the rest of the treatment without bandaging, and notwithstanding, if they meet with another case of the same description, they treat it in the same manner, for they do not think that the application of the bandages on both sides, and the exposure of the wound are the cause of what happened, but some other untoward circumstance. Wherefore I would not have written so much on this subject, if I had not well known that this mode of bandaging is unsuitable, and yet that many conduct the treatment in this way, whose mistake it is of vital importance to correct, while what is here said is a proof, that what was formerly written as to the circumstances under which bandages should be tightly applied to fractures or otherwise has been correctly written.

26 As a general rule it may be said, that in those cases in which a separation of bone is not expected, the same treatment should be applied as when the fractures are not complicated with an external wound, for the extension, adjustment of the bones, and the bandaging, are to be conducted in the same manner. To the wound itself a cerate mixed with pitch is to be applied, a thin folded compress is to be bound upon it, and the parts around are to be anointed with white cerate. The cloths for bandages and the other things should be torn broader than in cases in which there is no wound, and the first turn of the bandage should be a good deal broader than the wound. For a narrower bandage than the wound binds the wound like a girdle, which is not proper, or the first turn should comprehend the whole wound, and the bandaging should extend beyond it on both sides. The bandage then should be put on in the direction of the wound, and should be not quite so tight as when there is no wound, but the bandage should be otherwise applied in the manner described above. The bandages should be of a soft consistence, and more especially so in such cases than in those not complicated with a wound. The number of bandages should not

be smaller, but rather greater than those formerly described. When applied, the patient should have the feeling of the parts being properly secured, but not too tight, and in particular he should be able to say that they are firm about the wound. And the intervals of time during which the parts seem to be properly adjusted, and those in which they get loose, should be the same as those formerly described. The bandages should be renewed on the third day, and the after treatment conducted in the same manner as formerly described, except that in the latter case the compression should be somewhat less than in the former. And if matters go on properly, the parts about the wound should be found at every dressing always more and more free of swelling, and the swelling should have subsided on the whole part comprehended by the bandages. And the suppurations will take place more speedily than in the case of wounds treated otherwise, and the pieces of flesh in the wound which have become black and dead, will sooner separate and fall off under this plan of treatment than any other, and the sore will come more quickly to cicatrization when thus treated than otherwise. The reason of all this is, that the parts in which the wound is situated, and the surrounding parts, are kept free of swelling. In all other respects the treatment is to be conducted as in cases of fracture without a wound of the integuments. Splints should not be applied. On this account the bandages should be more numerous than in the former case, both because they must be put on less tight, and because the splints are later of being applied. But if you do apply the splints, they should not be applied along the wound, and they are to be put on in a loose manner, especial care being taken that there may be no great compression from the splints. This direction has been formerly given. And the diet should be more restricted, and for a longer period, in those cases in which there is a wound at the commencement, and when the bones protrude through the skin, and, in a word, the greater the wound, the more severe and protracted should the regimen be.

27 The treatment of the sores is the same in those cases of fracture in which there was no wound of the skin at first, but

one has formed in the course of treatment, owing to the pressure of the splints occasioned by the bandages, or from any other cause. In such cases it is ascertained that there is an ulcer, by the pain and throbbing, and the swelling in the extremities becomes harder than usual, and if you apply your finger the redness disappears, but speedily returns. If you suspect anything of the kind you must loose the dressing, if there be any itching below the under-bandages, or in any other part that is bandaged, and used a pitched cerate instead of the other. If there be nothing of that, but if the ulcer be found in an irritable state, being very black and foul, and the fleshy parts about to suppurate, and the tendons to slough away, in these cases no part is to be exposed to the air, nor is anything to be apprehended from these suppurations, but the treatment is to be conducted in the same manner as in those cases in which there was an external wound at first. You must begin to apply the bandages loosely at the swelling in the extremities, and then gradually proceed upward with the bandaging, so that it may be tight at no place, but particularly firm at the sore, and less so elsewhere. The first bandages should be clean and not narrow, and the number of bandages should be as great as in those cases in which the splints were used, or somewhat fewer. To the sore itself a compress, anointed with white cerate, will be sufficient, for if a piece of flesh or nerve (*tendon*²) become black, it will fall off, for such sores are not to be treated with acrid, but with emollient applications, like burns. The bandages are to be renewed every third day, and no splints are to be applied, but rest is to be more rigidly maintained than in the former cases, along with a restricted diet. It should be known, that if any piece of flesh or tendon be to come away, the mischief will spread much less, and the parts will much more speedily drop off, and the swelling in the surrounding parts will much more completely subside, under this treatment, than if any of the cleansing applications be put upon the sore. And if any part that is to come away shall fall off, the part will incarnate sooner when thus treated than otherwise, and will more speedily cicatrize. Such are the good effects of knowing how a bandage can be well and moderately applied.

But a proper position, the other parts of the regimen, and suitable bandages co-operate

28. If you are deceived with regard to a recent wound, supposing there will be no exfoliation of the bones, while they are on the eve of coming out of the sore, you must not hesitate to adopt this mode of treatment, for no great mischief will result, provided you have the necessary dexterity to apply the bandages well and without doing any harm. And this is a symptom of an exfoliation of bone being about to take place under this mode of treatment, pus runs copiously from the sore, and appears striving to make its escape. The bandage must be renewed more frequently on account of the discharge, since otherwise fevers come on, if the sore and surrounding parts be compressed by the bandages they become wasted. Cases complicated with the exfoliation of very small bones, do not require any change of treatment, only the bandages should be put on more loosely, so that the discharge of pus may not be intercepted, but left free, and the dressings are to be frequently renewed until the bone exfoliate, and the splints should not be applied until then.

29. Those cases in which the exfoliation of a larger piece of bone is expected, whether you discover this at the commencement, or perceive subsequently that it is to happen, no longer require the same mode of treatment, only that the extension and arrangement of the parts are to be performed in a manner that has been described, but having formed double compresses, not less than half a fathom in breadth (being guided in this by the nature of the wound), and considerably shorter than what would be required to go twice round the part that is wounded, but considerably longer than to go once round, and in number what will be sufficient, these are to be dipped in a black austere wine, and beginning at the middle, as is done in applying the double-headed bandage, you are to wrap the part around and proceed crossing the heads in the form of the bandage called "ascia." These things are to be done at the wound, and on both sides of it, and there must be no compression, but they are to be laid on so as to give support to the wound. And on the wound itself is to be applied the pitched cerate, or one of the applications

to recent wounds, or any other medicine which will suit with the embrocation And if it be the summer season, the compresses are to be frequently damped with wine, but if the winter season, plenty of greasy wool, moistened with wine and oil, should be applied And a goat's skin should be spread below, so as to carry off the fluids which run from the wound, these must be guarded against, and it should be kept in mind, that parts which remain long in the same position are subject to excoriations which are difficult to cure

30 In such cases as do not admit of bandaging according to any of the methods which have been described, or which will be described, great pains should be taken that the fractured part of the body be laid in a right position, and attention should be paid that it may incline upward rather than downward But if one would wish to do the thing well and dexterously, it is proper to have recourse to some mechanical contrivance, in order that the fractured part of the body may undergo proper and not violent extension, and this means is particularly applicable in fractures of the leg There are certain physicians who, in all fractures of the leg, whether bandages be applied or not, fasten the sole of the foot to the couch, or to some other piece of wood which they have fixed in the ground near the couch These persons thus do all sorts of mischief but no good, for it contributes nothing to the extension that the foot is thus bound, as the rest of the body will no less sink down to the foot, and thus the limb will no longer be stretched, neither will it do any good toward keeping the limb in a proper position, but will do harm, for when the rest of the body is turned to this side or that, the bandaging will not prevent the foot and the bones belonging to it from following the rest of the body For if it had not been bound it would have been less distorted, as it would have been the less prevented from following the motion of the rest of the body But one should sew two balls of Egyptian leather, such as are worn by persons confined for a length of time in large shackles, and the balls should have coats on each side, deeper toward the wound, but shorter toward the joints, and the balls should be well stuffed and soft, and fit well, the one above the

ankles, and the other below the knee Sideways it should have below two appendages, either of a single or double thong, and short, like loops, the one set being placed on either side of the ankle, and the other on the knee And the other upper ball should have others of the same kind in the same line Then taking four rods, made of the cornel tree, of equal length, and of the thickness of a finger, and of such length that when bent they will admit of being adjusted to the appendages, care should be taken that the extremities of the rods bear not upon the skin, but on the extremities of the balls There should be three sets of rods, or more, one set a little longer than another, and another a little shorter and smaller, so that they may produce greater or less distention, if required Either of these sets of rods should be placed on this side and that of the ankles If these things be properly contrived, they should occasion a proper and equable extension in a straight line, without giving any pain to the wound, for the pressure, if there is any, should be thrown at the foot and the thigh And the rods are commodiously arranged on either side of the ankles, so as not to interfere with the position of the limb, and the wound is easily examined and easily arranged And, if thought proper, there is nothing to prevent the two upper rods from being fastened to one another, and if any light covering be thrown over the limb, it will thus be kept off from the wound If, then, the balls be well made, handsome, soft, and newly stitched, and if the extension by the rods be properly managed, as has been already described, this is an excellent contrivance, but if any of them do not fit properly, it does more harm than good And all other mechanical contrivances should either be properly done, or not be had recourse to at all, for it is a disgraceful and awkward thing to use mechanical means in an unmechanical way

31 Moreover, the greater part of physicians treat fractures, both with and without an external wound, during the first days, by means of unwashed wool, and there does not appear to be anything improper in this It is very excusable for those who are called upon to treat newly-received accidents of this kind, and who have no cloth for bandages at hand, to do them up

with wool, for, except cloth for bandages, one could not have anything better than wool in such cases, but a good deal should be used for this purpose, and it should be well carded and not rough, for in small quantity and of a bad quality it has little power. But those who approve of binding up the limb with wool for a day or two, and on the third and fourth apply bandages, and make the greatest compression and extension at that period, such persons show themselves to be ignorant of the most important principles of medicine, for, in a word, at no time is it so little proper to disturb all kinds of wounds as on the third and fourth day, and all sort of probing should be avoided on these days in whatever other injuries are attended with irritation. For, generally, the third and fourth day in most cases of wounds, are those which give rise to exacerbations, whether the tendency be to inflammation, to a foul condition of the sore, or to fevers. And if any piece of information be particularly valuable this is, to which of the most important cases in medicine does it not apply? and that not only in wounds but in many other diseases, unless one should call all other diseases wounds. And this doctrine is not devoid of a certain degree of plausibility, for they are allied to one another in many respects. But those who maintain that wool should be used until after the first seven days, and then that the parts should be extended and adjusted, and secured with bandages, would appear not to be equally devoid of proper judgment, for the most dangerous season for inflammation is then past, and the bones being loose can be easily set after the lapse of these days. But still this mode of treatment is far inferior to that with bandages from the commencement, for, the latter method exhibits the patient on the seventh day free from inflammation, and ready for complete bandaging with splints, while the former method is far behind in this respect, and is attended with many other bad effects which it would be tedious to describe.

31 In those cases of fracture in which the bones protrude and cannot be restored to their place, the following mode of reduction may be practiced — Some small pieces of iron are to be prepared like the levers which the cutters of stone make use of, one being

rather broader and another narrower, and there should be three of them at least, and still more, so that you may use those that suit best, and then, along with extension, we must use these as levers, applying the under surface of the piece of iron to the under fragment of the bone, and the upper surface to the upper bone, and, in a word, we must operate powerfully with the lever as we would do upon a stone or a piece of wood. The pieces of iron should be as strong as possible, so that they may not bend. This is a powerful assistance, provided the pieces of iron be suitable, and one use them properly as levers. Of all the mechanical instruments used by men, the most powerful are these three, the axis in peritrochio, the lever, and the wedge. Without these, one or all, men could not perform any of their works which require great force. Wherefore, reduction with the lever is not to be despised, for the bones will be reduced in this way, or not at all. But if the upper fragment which rides over the other does not furnish a suitable point of support for the lever, but the protruding part is sharp, you must scoop out of the bone what will furnish a proper place for the lever to rest on. The lever, along with extension, may be had recourse to on the day of the accident, or next day, but by no means on the third, the fourth, and the fifth. For if the limb is disturbed on these days, and yet the fractured bones not reduced, inflammation will be excited, and this no less if they are reduced, for convulsions are more apt to occur if reduction take place, than if the attempt should fail. These facts should be well known, for if convulsions should come on when reduction is effected, there is little hope of recovery, but it is of use to displace the bones again if this can be done without trouble. For it is not at the time when the parts are in a particularly relaxed condition that convulsions and tetanus are apt to supervene, but when they are more than usually tense. In the case we are now treating of, we should not disturb the limb on the aforesaid days, but strive to keep the wound as free from inflammation as possible, and especially encourage suppuration in it. But when seven days have elapsed, or rather more, if there be no fever, and if the wound be not inflamed, then there will be less to prevent an attempt at reduction,

if you hope to succeed, but otherwise you need not take and give trouble in vain

32 When you have reduced the bones to their place, the modes of treatment, whether you expect the bones to exfoliate or not, have been already described. All those cases in which an exfoliation of bone is expected, should be treated by the method of bandaging with cloths, beginning for the most part at the middle of the bandage, as is done with the double-headed bandage, but particular attention should be paid to the shape of the wound, so that its lips may gape or be distorted as little as possible under the bandage. Sometimes the turns of the bandage have to be made to the right, and sometimes to the left, and sometimes a double-headed bandage is to be used.

33 It should be known that bones, which it has been found impossible to reduce, as well as those which are wholly denuded of flesh, will become detached. In some cases the upper part of the bone is laid bare, and in others the flesh dies all around, and, from a sore of long standing, certain of the bones become carious, and some not, some more, and some less, and in some the small, and in others the large bones. From what has been said it will be seen, that it is impossible to tell in one word when the bones will separate. Some come away more quickly, owing to their smallness, and some from being merely fixed at the point, and some, from pieces not separating, but merely exfoliating, become dried up and putrid, and besides, different modes of treatment have different effects. For the most part, the bones separate most quickly in those cases in which suppuration takes place most quickly, and when new flesh is most quickly formed, and is particularly sound, for the flesh which grows up below in the wound generally elevates the pieces of bone. It will be well if the whole circle of the bone separate in forty days, for in some cases it is protracted to sixty days, and in some to more, for the more porous pieces of bone separate more quickly, but the more solid come away more slowly, but the other smaller splinters in much less time, and others otherwise. A portion of bone which protrudes should be sawn off for the following reasons: if it cannot be reduced, and if it appears

that only a small piece is required in order that it may get back into its place, and if it be such that it can be taken out, and if it occasions inconvenience and irritates any part of the flesh, and prevents the limb from being properly laid, and if, moreover, it be denuded of flesh, such a piece of bone should be taken off. With regard to the others, it is not of much consequence whether they be sawed off or not. For it should be known for certain, that such bones as are completely deprived of flesh, and have become dried, all separate completely. Those which are about to exfoliate should not be sawn off. Those that will separate completely must be judged of from the symptoms that have been laid down.

34 Such cases are to be treated with compresses and vinous applications, as formerly laid down regarding bones which will separate. We must avoid wetting it at the beginning with anything cold, for there is danger of febrile rigors, and also of convulsions, for convulsions are induced by cold things, and also sometimes by wounds. It is proper to know that the members are necessarily shortened in those cases in which the bones have been broken, and have healed the one across the other, and in those cases in which the whole circle of the bone has become detached.

35 Those cases in which the bone of the thigh, or of the arm, protrudes, do not easily recover. For the bones are large, and contain much marrow, and many important nerves, muscles, and veins are wounded at the same time. And if you reduce them, convulsions usually supervene, and, if not reduced, acute bilious fevers come on, with singultus and mortification. The chances of recovery are not fewer in those cases in which the parts have not been reduced, nor any attempts made at reduction. Still more recover in those cases in which the lower, than those in which the upper part of the bone protrudes, and some will recover when reduction has been made, but very rarely indeed. For modes of treatment and peculiarity of constitution make a great difference as to the capability of enduring such an injury. And it makes a great difference if the bones of the arm and of the thigh protrude to the inside, for there are many and im-

portant vessels situated there, some of which, if wounded, will prove fatal, there are such also on the outside, but of less importance. In wounds of this sort, then, one ought not to be ignorant of the dangers, and should prognosticate them in due time. But if you are compelled to have recourse to reduction, and hope to succeed, and if the bones do not cross one another much, and if the muscles are not contracted (for they usually are contracted), the lever in such cases may be advantageously employed.

36 Having effected the reduction, you must give an emollient draught of hellebore the same day, provided it has been reduced on the day of the accident, but otherwise it should not be attempted. The wound should be treated with the same things as are used in fractures of the bones of the head, and nothing cold should be applied, the patient should be restricted from food altogether, and if naturally of a bilious constitution, he should have for a diet a little fragrant *oxyglyky* sprinkled on water, but if he is not bilious, he should have water for drink, and if fever of the continual type come on, he is to be confined to this regimen for fourteen days at least, but if he be free of fever, for only seven days, and then you must bring him back by degrees to a common diet. To those cases in which the bones have not been reduced, a similar course of medicine should be administered, along with the same treatment of the sores and regimen, and in like manner the suspended part of the body should not be stretched, but should rather be contracted, so as to relax the parts about the wound. The separation of the bones is protracted, as also was formerly stated. But one should try to escape from such cases, provided one can do so honorably, for the hopes of recovery are small, and the dangers many, and if the physician do not reduce the fractured bones he will be looked upon as unskillful, while by reducing them he will bring the patient nearer to death than to recovery.

37 Luxations and subluxations at the knee are much milder accidents than subluxations and luxations at the elbow. For the knee-joint, in proportion to its size, is more compact than that of the arm, and has a more even conformation, and is

rounded, while the joint of the arm is large, and has many cavities And in addition, the bones of the leg are nearly of the same length, for the external one overtops the other to so small an extent as hardly to deserve being mentioned, and therefore affords no great resistance, although the external nerve (*ligament*²) at the ham arises from it, but the bones of the fore-arm are unequal, and the shorter is considerably thicker than the other, and the more slender (*ulna*²) protrudes, and passes up above the joint, and to it (the *olecranon*²) are attached the nerves (*ligaments*²) which go downward to the junction of the bones, and the slender bone (*ulna*²) has more to do with the insertion of the ligaments in the arm than the thick bone (*radius*²) The configuration then of the articulations, and of the bones of the elbow, is such as I have described Owing to their configuration, the bones at the knee are indeed frequently dislocated, but they are easily reduced, for no great inflammation follows, nor any constriction of the joint They are displaced for the most part to the inside, sometimes to the outside, and occasionally into the ham The reduction in all these cases is not difficult, but in the dislocations inward and outward, the patient should be placed on a low seat, and the thigh should be elevated, but not much Moderate extension for the most part sufficeth, extension being made at the leg, and counter-extension at the thigh

38 Dislocations at the elbow are more troublesome than those at the knee, and, owing to the inflammation which comes on, and the configuration of the joint, are more difficult to reduce if the bones are not immediately replaced For the bones at the elbow are less subject to dislocation than those of the knee, but are more difficult to reduce and keep in their position, and are more apt to become inflamed and ankylosed

39 For the most part the displacements of these bones are small, sometimes toward the ribs, and sometimes to the outside, and the whole articulation is not displaced, but that part of the humerus remains in place which is articulated with the cavity of the bone of the fore-arm that has a protuberance (*ulna*²) Such dislocations, to whatever side, are easily reduced, and the extension is to be made in the line of the arm, one person making

extension at the wrist, and another grasping the armpit, while a third, applying the palm of his hand to the part of the joint which is displaced, pushes it inward, and at the same time makes counter-pressure on the opposite side near the joint with the other hand

40 The end of the humerus at the elbow gets displaced (*subluxated*?) by leaving the cavity of the ulna. Such luxations readily yield to reduction, if applied before the parts get inflamed. The displacement for the most part is to the inside, but sometimes to the outside, and they are readily recognized by the shape of the limb. And often such luxations are reduced without any powerful extension. In dislocations inward, the joint is to be pushed into its place, while the fore-arm is brought round to a state of pronation. Such are most of the dislocations at the elbow

41 But if the articular extremity of the humerus be carried to either side above the bone of the fore-arm, which is prominent, into the hollow of the arm (?), this rarely happens, but if it do happen, extension in the straight line is not so proper under such circumstances, for in such a mode of extension, the process of the ulna (*olecranon*?) prevents the bone of the arm (*humerus*?) from passing over it. In dislocations of this kind, extension should be made in the manner described when treating of the bandaging of fractured bones of the arm, extension being made upward at the armpit, while the parts at the elbow are pushed downward, for in this manner can the humerus be most readily raised above its cavity, and when so raised, the reduction is easy with the palms of the hand, the one being applied so as to make pressure on the protuberant part of the arm, and the other making counter-pressure, so as to push the bone of the fore-arm into the joint. This method answers with both cases. And perhaps this is the most suitable mode of reduction in such a case of dislocation. The parts may be reduced by extension in a straight line, but less readily than thus

42 If the arm be dislocated forward—this rarely happens, indeed, but what would a sudden shock not displace? for many other things are removed from their proper place, notwith-

standing a great obstacle,—in such a violent displacement the part (*olecranon*²) which passes above the prominent part of the bones is large, and the stretching of the nerves (*ligaments*²) is intense, and yet the parts have been so dislocated in certain cases. The following is the symptom of such a displacement the arm cannot be bent in the least degree at the elbow, and upon feeling the joint the nature of the accident becomes obvious. If, then, it is not speedily reduced, strong and violent inflammation, attended with fever, will come on, but if one happen to be on the spot at the time it is easily reduced. A piece of hard linen cloth (or a piece of hard linen, not very large, rolled up in a ball, will be sufficient) is to be placed across the bend of the elbow, and the arm is then to be suddenly bent at the elbow, and the hand brought up to the shoulder. This mode of reduction is sufficient in such displacements, and extension in the straight line can rectify this manner of dislocation, but we must use at the same time the palms of the hands, applying the one to the projecting part of the humerus at the bend of the arm for the purpose of pushing it back, and applying the other below to the sharp extremity of the elbow, to make counter-pressure, and incline the parts into the straight line. And one may use with advantage in this form of dislocation the method of extension formerly described, for the application of the bandages in the case of fracture of the arm, but when extension is made, the parts are to be adjusted, as has been also described above.

43 But if the arm be dislocated backward (but this very rarely happens, and it is the most painful of all, and the most subject to bilious fevers of the continual type, which prove fatal in the course of a few days), in such a case the patient cannot extend the arm. If you are quickly present, by forcible extension the parts may return to their place of their own accord, but if fever have previously come on, you must no longer attempt reduction, for the pain will be rendered more intense by any such violent attempt. In a word, no joint whatever should be reduced during the prevalence of fever, and least of all the elbow-joint.

44 There are also other troublesome injuries connected with

the elbow-joint, for example, the thicker bone (*radius*?) is sometime partially displaced from the other, and the patient can neither perform extension nor flexion properly. This accident becomes obvious upon examination with the hand at the bend of the arm near the division of the vein that runs up the muscle. In such a case it is not easy to reduce the parts to their natural state, nor is it easy, in the separation of any two bones united by symphysis, to restore them to their natural state, for there will necessarily be a swelling at the seat of the diastasis. The method of bandaging a joint has been already described in treating of the application of bandages to the ankle.

45 In certain cases the process of the ulna (*olecranon*?) behind the humerus is broken, sometimes its cartilaginous part, which gives origin to the posterior tendon of the arm, and sometimes its fore part, at the base of the anterior coronoid process, and when this displacement takes place, it is apt to be attended with malignant fever. The joint, however, remains in place, for its whole base protrudes at that point. But when the displacement takes place where its head overtops the arm, the joint becomes looser if the bone be fairly broken across. To speak in general terms, all cases of fractured bones are less dangerous than those in which the bones are not broken, but the veins and important nerves (*tendons*?) situated in these places are contused, for the risk of death is more immediate in the latter class of cases than in the former, if continual fever come on. But fractures of this nature seldom occur.

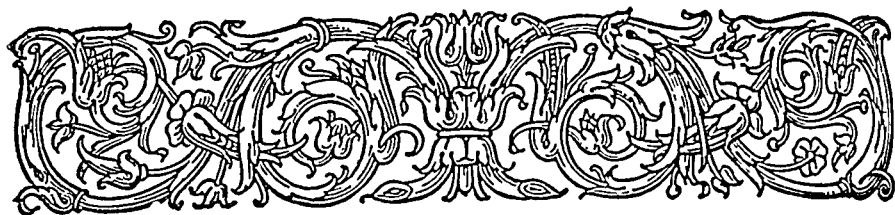
46 It sometimes happens that the head of the humerus is fractured at its epiphysis, and this, although it may appear to be a much more troublesome accident, is in fact a much milder one than the other injuries at the joint.

47 The treatment especially befitting each particular dislocation has been described, and it has been laid down as a rule, that immediate reduction is of the utmost advantage, owing to the rapid manner in which inflammation of the tendons supervenes. For even when the luxated parts are immediately reduced, the tendons usually become stiffened, and for a considerable time prevent extension and flexion from being performed.

to the ordinary extent All these cases are to be treated in a similar way, whether the extremity of the articulating bone be snapped off, whether the bones be separated, or whether they be dislocated, for they are all to be treated with plenty of bandages, compresses, and cerate, like other fractures The position of the joint in all these cases should be the same, as when a fractured arm or fore-arm has been bound up For this is the most common position in all dislocations, displacements, and fractures, and it is the most convenient for the subsequent movements, whether of extension or flexion, as being the intermediate stage between both And this is the position in which the patient can most conveniently carry or suspend his arm in a sling And besides, if the joint is to be stiffened by callus, it were better that this should not take place when the arm is extended, for this position will be a great impediment and little advantage, if the arm be wholly bent, it will be more useful, but it will be much more convenient to have the joint in the intermediate position when it becomes ankylosed So much with regard to position

48. In bandaging, the head of the first bandage should be placed at the seat of the injury, whether it be a case of fracture, of dislocation, or of diastasis (*separation?*), and the first turns should be made there, and the bandages should be applied most firmly at that place, and less so on either side The bandaging should comprehend both the arm and the fore-arm, and on both should be to a much greater extent than most physicians apply it, so that the swelling may be expelled from the seat of the injury to either side. And the point of the fore-arm should be comprehended in the bandaging, whether the injury be in that place or not, in order that the swelling may not collect there In applying bandages, we must avoid as much as possible accumulating many turns of the bandage at the bend of the arm For the principal compression should be at the seat of the injury, and the same rules are to be observed, and at the same periods, with regard to compression and relaxation, as formerly described respecting the treatment of broken bones, and the bandages should be renewed every third day, and they should appear

loose on the third day, as in the other case. And splints should be applied at the proper time (for there is nothing unsuitable in them, whether the bones be fractured or not, provided there is no fever), they should be particularly loose, whether applied to the arm or the fore-arm, but they must not be thick. It is necessary that they should be of unequal size, and that the one should ride over the other, whenever from the flexion it is judged proper. And the application of the compresses should be regulated in the same manner as has been stated with regard to the splints, and they should be put on in a somewhat more bulky form at the seat of the injury. The periods are to be estimated from the inflammation, and from what has been written on them above.



On the Articulations

IAM acquainted with one form in which the shoulder-joint is dislocated, namely, that into the armpit, I have never seen it take place upward nor outward, and yet I do not positively affirm whether it might be dislocated in these directions or not, although I have something which I might say on this subject. But neither have I ever seen what I considered to be a dislocation forward. Physicians, indeed, fancy that dislocation is very apt to occur forward, and they are more particularly deceived in those persons who have the fleshy parts about the joint and arm much emaciated, for, in all such cases, the head of the arm appears to protrude forward. And I in one case of this kind having said that there was no dislocation, exposed myself to censure from certain physicians and common people on that account, for they fancied that I alone was ignorant of what everybody else was acquainted with, and I could not convince them but with difficulty, that the matter was so. But if one will strip the point of the shoulder of the fleshy parts, and where the muscle (*deltoid*?) extends, and also lay bare the tendon that goes from the armpit and clavicle to the breast (*pectoral muscle*?), the head of the humerus will appear to protrude strongly forward, although not dislocated, for the head of the humerus naturally inclines forward, but the rest of the bone is turned outward. The humerus is connected obliquely with the cavity of the scapula, when the arm is stretched along the sides, but when the whole arm is stretched forward, then the head of the humerus is in a line with the cavity of the humerus, and no longer appears to protrude forward. And with regard to the variety we are now treating of, I have never seen a case of dislocation forward,

and yet I do not speak decidedly respecting it, whether such a dislocation may take place or not. When, then, a dislocation into the armpit takes place, seeing it is of frequent occurrence, many persons know how to reduce it, for it is an easy thing to teach all the methods by which physicians effect the reductions, and the best manner of applying them. The strongest of those methods should be used when the difficulty of reduction is particularly great. The strongest is the method to be last described.

2 Those who are subject to frequent dislocations at the shoulder-joint, are for the most part competent to effect the reduction themselves, for, having introduced the knuckles of the other hand into the armpit, they force the joint upward, and bring the elbow toward the breast. The physician might reduce it in the same manner, if having introduced his fingers into the armpit on the inside of the dislocated joint, he would force it from the ribs, pushing his own head against the acromion, in order to make counter-pressure, and with his knees applied to the patient's elbow pushing the arm to the sides. It will be of advantage if the operator has strong hands, or the physician may do as directed with his head and hands, while another person brings the elbow toward the breast. Reduction of the shoulder may also be effected by carrying the fore-arm backward to the spine, and then with the one hand grasping it at the elbow, to bend the arm upward, and with the other to support it behind at the articulation. This mode of reduction, and the one formerly described, are not natural, and yet by rotating the bone of the joint, they force it to return.

3 Those who attempt to perform reduction with the heel, operate in a manner which is an approach to the natural. The patient must lie on the ground upon his back, while the person who is to effect the reduction is seated on the ground upon the side of the dislocation, then the operator, seizing with his hand the affected arm, is to pull it, while with his heel in the armpit he pushes in the contrary direction, the right heel being placed in the right armpit, and the left heel in the left armpit. But a round ball of a suitable size must be placed in the hollow of the armpit, the most convenient are very small and hard balls, formed from

several pieces of leather sewed together For without something of the kind the heel cannot reach to the head of the humerus, since, when the arm is stretched, the armpit becomes hollow, the tendons on both sides of the armpit making counter-contraction so as to oppose the reduction But another person should be seated on the other side of the patient to hold the sound shoulder, so that the body may not be dragged along when the arm of the affected side is pulled, and then, when the ball is placed in the armpit, a supple piece of thong sufficiently broad is to be placed round it, and some person taking hold of its two ends is to seat himself above the patient's head to make counter-extension, while at the same time he pushes with his foot against the bone at the top of the shoulder The ball should be placed as much on the inside as possible, upon the ribs, and not upon the head of the humerus

4 There is another method of reduction performed by the shoulder of a person standing The person operating in this way, who should be taller than the patient, is to take hold of his arm and place the sharp point of his own shoulder in the patient's armpit, and push it in so that it may lodge there, and having for his object that the patient may be suspended at his back by the armpit, he must raise himself higher on this shoulder than the other, and he must bring the arm of the suspended patient as quickly as possible to his own breast In this position he should shake the patient when he raises him up, in order that the rest of the body may be a counterpoise to the arm which is thus held But if the patient be very light, a light child should be suspended behind along with him These methods of reduction are all of easy application in the palestra, as they can all be performed without instruments, but they may also be used elsewhere

5 Those who accomplish the reduction by forcibly bending it round a pestle, operate in a manner which is nearly natural But the pestle should be wrapped in a soft shawl (for thus it will be less slippery), and it should be forced between the ribs and the head of the humerus And if the pestle be short, the patient should be seated upon something, so that his arm can with difficulty pass above the pestle But for the most part the pestle

should be longer, so that the patient when standing may be almost suspended upon the piece of wood. And then the arm and fore-arm should be stretched along the pestle, whilst some person secures the opposite side of the body by throwing his arms round the neck, near the clavicle.

6 But the method with a ladder is another of the same kind, and still better, since by it the body can be more safely counter-poised on this side, and that, while in the method which the piece of wood resembling a pestle, there is danger of the body tumbling to either side. But some round thing should be tied upon the step of the ladder which may be fitted to the armpit, whereby the head of the bone may be forced into its natural place.

7 The following, however, is the strongest of all the methods of reduction. We must get a piece of wood, five, or at least four inches broad, two inches in thickness, or still thinner, and two cubits in length, or a little less, and its extremity at one end should be rounded, and made very narrow and very slender there, and it should have a slightly projecting edge (*ambe*) on its round extremity, not on the part that is to be applied to the side, but to the head of the humerus, so that it may be adjusted in the armpit at the sides under the head of the humerus, and a piece of soft shawl or cloth should be glued to the end of the piece of wood, so as to give the less pain upon pressure. Then having pushed the head of this piece of wood as far inward as possible between the ribs and the head of the humerus, the whole arm is to be stretched along this piece of wood, and is to be bound round at the arm, the fore-arm, and the wrist, so that it may be particularly well secured, but great pains should be taken that the extremity of this piece of wood should be introduced as far as possible into the armpit, and that it is carried past the head of the humerus. Then a cross-beam is to be securely fastened between two pillars, and afterward the arm with the piece of wood attached to it is to be brought over this cross-beam, so that the arm may be on the one side of it and the body on the other, and the cross-beam in the armpit, and then the arm with the piece of wood is to be forced down on the one side of the cross-beam, and the rest of the body on the other. The cross-beam is to be bound so high that the

rest of the body may be raised upon tip-toes This is by far the most powerful method of effecting reduction of the shoulder, for one thus operates with the lever upon the most correct principles, provided only the piece of wood be placed as much as possible within the head of the humerus, and thus also the counter-balancing weights will be most properly adjusted, and safely applied to the bone of the arm Wherefore recent cases in this way may be reduced more quickly than could be believed, before even extension would appear to be applied, and this is the only mode of reduction capable of replacing old dislocations, and this it will effect, unless flesh had already filled up the (glenoid) cavity, and the head of the humerus has formed a socket for itself in the place to which it has been displaced, and even in such an old case of dislocation, it appears to me that we could effect reduction (for what object would a lever power properly applied not move?), but it would not remain in its place, but would be again displaced as formerly The same thing may be effected by means of the ladder, by preparing it in the same manner If the dislocation be recent, a large Thessalian chair may be sufficient to accomplish this purpose, the wood, however, should be dressed up as described before, but the patient should be seated sideways on the chair, and then the arm, with the piece of wood attached to it, is to be brought over the back of the chair, and force is to be applied to the arm, with the wood on the one side, and the body on the other side The same means may be applied with a double door One should always use what happens to be at hand

8 Wherefore it should be known that one constitution differs much from another as to the facility with which dislocations in them may be reduced, and one articular cavity differs much from another, the one being so constructed that the bone readily leaps out of it, and another less so, but the greatest difference regards the binding together of the parts by the nerves (*ligaments*?) which are slack in some and tight in others For the humidity in the joints of men is connected with the state of the ligaments, when they are slack and yielding, for you may see many people who are so humid (*flabby*?) that when they choose they can disarticulate their joints without pain, and reduce them in like manner The

habit of the body also occasions a certain difference, for in those who are in a state of embonpoint and fleshy the joint is rarely dislocated, but is more difficult to reduce, but when they are more attenuated and leaner than usual, then they are more subject to dislocations which are more easily reduced. And the following observation is a proof that matters are so, for in cattle the thighs are most apt to be dislocated at the hip-joint, when they are most particularly lean, which they are at the end of winter, at which time then they are particularly subject to dislocations, (if I may be allowed to make such an observation while treating of a medical subject), and therefore Homer has well remarked, that of all beasts oxen suffer the most at that season, and especially those employed at the plow as being worked in the winter season. In them, therefore, dislocations happen most frequently, as being at that time most particularly reduced in flesh. And other cattle can crop the grass when it is short, but the ox cannot do so until it becomes long, for, in the others, the projection of the lip is slender, and so is the upper lip, but in the ox the projection of the lip is thick, and the upper jaw is thick and obtuse, and therefore they are incapable of seizing short herbs. But the *solidungula* as having prominent teeth in both their front jaws, can crop the grass and grasp it with their teeth while short, and delight more in short grass than in rank, for, in general, short grass is better and more substantial than rank, as having not yet given out its fructification. Wherefore the poet has the following line

“As when to horned cattle dear the vernal season comes,”¹

because rank grass appears to be most sought after by them. But otherwise in the ox, this joint is slacker than in other animals, and, therefore, this animal drags his foot in walking more than any other, and especially when lank and old. For all these reasons the ox is most particularly subject to dislocations, and I have made the more observations respecting him, as they confirm

¹ It is certain that there is no such line in the works of Homer as they have come down to us, and it is singular that Galen takes no notice of it, so that it is impossible to explain how our author came to use it.

all that was said before on this subject With regard, then, to the matter on hand, I say that dislocations occur more readily, and are more speedily reduced in those who are lean than in those who are fleshy, and in those who are humid and lank there is less inflammation than in such as are dry and fleshy, and they are less compactly knit hereafter, and there is more mucosity than usual in cases not attended with inflammation, and hence the joints are more liable to luxations, for, in the main, the articulations are more subject to mucosities in those who are lean than in those who are fleshy, and the flesh of lean persons who have not been reduced by a proper course of discipline abounds more with mucosity than that of fat persons But in those cases in which the mucosity is accompanied with inflammation, the inflammation binds (*braces*²) the joint, and hence those who have small collections of mucosities are not very subject to dislocations, which they would be if the mucosity had not been accompanied with more or less inflammation

9 In cases of dislocation those persons who are not attacked with inflammation of the surrounding parts, can use the shoulder immediately without pain, and do not think it necessary to take any precautions with themselves, it is therefore the business of the physician to warn them beforehand that dislocation is more likely to return in such cases than when the tendons have been inflamed This remark applies to all the articulations, but particularly to those of the shoulder and knee, for these are the joints most subject to luxations But those who have inflammation of the ligaments cannot use the shoulder, for the pain and the tension induced by the inflammation prevent them Such cases are to be treated with cerate, compresses, and plenty of bandages, but a ball of soft clean wool is to be introduced into the armpit, to fill up the hollow of it, that it may be a support to the bandaging, and maintain the joint *in situ* The arm, in general, should be inclined upward as much as possible, for thus it will be kept at the greatest possible distance from the place at which the head of the humerus escaped And when you bandage the shoulder you must fasten the arms to the sides with a band, which is to be carried round the body The shoulder should be

rubbed gently and softly The physician ought to be acquainted with many things, and among others with friction, for from the same name the same results are not always obtained, for friction could brace a joint when unseasonably relaxed, and relax it when unseasonably hard, but we will define what we know respecting friction in another place The shoulder, then, in such a state, should be rubbed with soft hands, and, moreover, in a gentle manner, and the joint should be moved about, but not roughly, so as to excite pain Things get restored sometimes in a greater space of time, and sometimes in a smaller

10 A dislocation may be recognized by the following symptoms —Since the parts of a man's body are proportionate to one another, as the arms and the legs, the sound should always be compared with the unsound, and the unsound with the sound, not paying regard to the joints of other individuals (for one person's joints are more prominent than another's), but looking to those of the patient, to ascertain whether the sound joint be unlike the unsound This is a proper rule, and yet it may lead to much error, and on this account it is not sufficient to know this art in theory, but also by actual practice, for many persons from pain, or from any other cause, when their joints are not dislocated, cannot put the parts into the same positions as the sound body can be put into, one ought therefore to know and be acquainted beforehand with such an attitude But in a dislocated joint the head of the humerus appears lying much more in the armpit than it is in the sound joint, and also, above, at the top of the shoulder, the part appears hollow, and the acromion is prominent, owing to the bone of the joint having sunk into the part below, there is a source of error in this case also, as will be described afterward, for it deserves to be described, and also, the elbow of the dislocated arm is farther removed from the ribs than that of the other, but by using force it may be approximated, though with considerable pain, and also they cannot, with the elbow extended, raise the arm to the ear, as they can the sound arm, nor move it about as formerly in this direction and that These, then, are the symptoms of dislocation at the shoulder The methods of reduction and the treatment are as described

II It deserves to be known how a shoulder which is subject to frequent dislocations should be treated For many persons owing to this accident have been obliged to abandon gymnastic exercises, though otherwise well qualified for them, and from the same misfortune have become inept in warlike practices, and have thus perished And this subject deserves to be noticed, because I have never known any physician treat the case properly, some abandon the attempt altogether, and others hold opinions and practice the very reverse of what is proper For many physicians have burned the shoulders subject to dislocation, at the top of the shoulder, at the anterior part where the head of the humerus protrudes, and a little behind the top of the shoulder, these burnings, if the dislocation of the arm were upward, or forward, or backward, would have been properly performed, but now, when the dislocation is downward, they rather promote than prevent dislocations, for they shut out the head of the humerus from the free space above The cautery should be applied thus taking hold with the hands of the skin at the armpit, it is to be drawn into the line, in which the head of the humerus is dislocated, and then the skin thus drawn aside is to be burnt to the opposite side The burnings should be performed with irons, which are not thick nor much rounded, but of an oblong form, (for thus they pass the more readily through,) and they are to be pushed forward with the hand, the cauteries should be red-hot, that they may pass through as quickly as possible, for such as are thick pass through slowly, and occasion eschars of a greater breadth than convenient, and there is danger that the cicatrices may break into one another, which, although nothing very bad, is most unseemly, or awkward When you have burnt through, it will be sufficient, in most cases, to make eschars only in the lower part, but if there is no danger of the ulcers passing into one another, and there is a considerable piece of skin between them, a thin spatula is to be pushed through these holes which have been burned, while, at the same time, the skin is stretched, for otherwise the instrument could not pass through, but when you have passed it through you must let go the skin, and then between the two eschars you should form another eschar with a

slender iron, and burn through until you come in contact with the spatula. The following directions will enable you to determine how much of the skin of the armpit should be grasped, all men have glands in the armpit greater or smaller, and also in many other parts of the body. But I will treat in another work of the whole constitution of the glands, and explain what they are, what they signify, and what are their offices. The glands, then, are not to be taken hold of, nor the parts internal to the glands, for this would be attended with great danger, as they are adjacent to the most important nerves. But the greater part of the substances external to the glands are to be grasped, for there is no danger from them. And this, also, it is proper to know, that if you raise the arm much, you will not be able to grasp any quantity of skin worth mentioning, for it is all taken up with the stretching, and also the nerves, which by all means you must avoid wounding, become exposed and stretched in this position, but if you only raise the arm a little, you can grasp a large quantity of skin, and the nerves which you ought to guard against are left within, and at a distance from the operation. Should not, then, the utmost pains be taken in the whole practice of the art to find out the proper attitude in every case? So much regarding the armpit, and these contractions will be sufficient, provided the eschars be properly placed. Without the armpit there are only two places where one might place the eschars to obviate this affection, the one before and between the head of the humerus and the tendon at the armpit, and then the skin may be fairly burned through, but not to any great depth, for there is a large vein adjacent, and also nerves, neither of which must be touched with the heat. But externally, one may form another eschar considerably above the tendon at the armpit, but a little below the head of the humerus, and the skin must be burned fairly through, but it must not be made very deep, for fire is inimical to the nerves. Through the whole treatment the sores are to be so treated, as to avoid all strong extension of the arm, and this is to be done moderately, and only as far as the dressing requires, for thus they will be less cooled (for it is of importance to cover up all sorts of burns if one would treat them mildly), and then the

lips of them will be less turned aside, there will be less hemorrhage and fear of convulsions. But when the sores have become clean, and are going on to cicatrization, then by all means the arm is to be bound to the side night and day, and even when the ulcers are completely healed, the arm must still be bound to the side for a long time, for thus more especially will cicatrization take place, and the wide space into which the humerus used to escape will become contracted.

12 When attempts to reduce a dislocated shoulder have failed, if the patient be still growing, the bone of the affected arm will not increase like the sound one, for although it does increase in so far it becomes shorter than the other, and those persons called *weasel-armed*, become so from two accidents, either from having met with this dislocation *in utero*, or from another accident, which will be described afterward. But those who while they were children have had deep-seated suppurations about the head of the bone, all become weasel-armed, and this, it should be well known, will be the issue, whether the abscess be opened by an incision or cautery, or whether it break spontaneously. Those who are thus affected from birth are quite able to use the arm, yet neither can they raise the arm to the ear, by extending the elbow, but they do this much less efficiently than with the sound arm. But in those who have had the shoulder dislocated after they were grown up, and when it has not been reduced, the top of the shoulder becomes much less fleshy, and the habit of body at that part is attenuated, but when they cease to have pain, whatever they attempt to perform by raising the elbow from the sides obliquely, they can no longer accomplish as formerly, but whatever acts are performed by carrying the arm around by the sides, either backward or forward, all those they can perform, for they can work with an auger or a saw, or with a hatchet, and can dig, by not raising the elbow too much, and do all other kinds of work which are done in similar attitudes.

13 In those cases where the acromion has been torn off, the bone which is thus separated appears prominent. The bone is the bond of connection between the clavicle and scapula, for in this respect the constitution of man is different from that of

other animals, physicians are particularly liable to be deceived in this accident (for as the separated bone protrudes, the top of the shoulder appears low and hollow), so that they make preparations as if for dislocation of the shoulder, for I have known many physicians, otherwise not inexpert at the art, who have done much mischief by attempting to reduce such shoulders, thus supposing it a case of dislocation, and they did not desist until they gave over hopes of succeeding, or committed the mistake of supposing that they had reduced the shoulder. The treatment, in these cases, is similar to that which is applicable in others of a like kind, namely, cerate, compresses, and suitable bandaging with linen cloths. The projecting part must be pushed down, and the greater number of compresses are to be placed on it, and most compression is to be applied at that part, and the arm being fastened to the side is to be kept elevated, for thus the parts which had been torn asunder are brought into closest proximity with one another. All this should be well known, and if you choose you may prognosticate safely that no impediment, small or great, will result from such an injury at the shoulder, only there will be a deformity in the place, for the bone cannot be properly restored to its natural situation, but there must necessarily be more or less tumefaction in the upper part. For neither can any other bone be made exactly as it was, which having becoming incorporated with another bone, and having grown to it as an apophysis, has been torn from its natural situation. If properly bandaged, the acromion becomes free of pain in a few days.

14 When a fractured clavicle is fairly broken across it is more easily treated, but when broken obliquely it is more difficult to manage. Matters are different in these cases from what one would have supposed, for a bone fairly broken across can be more easily restored to its natural state, and with proper care the upper part may be brought down by means of suitable position and proper bandaging, and even if not properly set, the projecting part of the bone is not very sharp. But in oblique fractures the case is similar to that of bones which have been torn away, as formerly described, for they do not admit of being

restored to their place, and the prominence of the bone is very sharp. For the most part, then, it should be known, no harm results to the shoulder or to the rest of the body from fracture of the clavicle, unless it sphacelate, and this rarely happens. A deformity, however, may arise from fracture of the clavicle, and in these cases it is very great at first, but by and by it becomes less. A fractured clavicle, like all other spongy bones, gets speedily united, for 'all such bones form callus in a short time. When, then, a fracture has recently taken place, the patients attach much importance to it, as supposing the mischief greater than it really is, and the physicians bestow great pains in order that it may be properly bandaged, but in a little time the patients, having no pain, nor finding any impediment to their walking or eating, become negligent, and the physicians finding they cannot make the parts look well, take themselves off, and are not sorry at the neglect of the patients, and in the meantime the callus is quickly formed². The method of dressing which is most appropriate, is similar to that used in ordinary cases, consisting of cerate, compresses, and bandages, and it should be most especially known in this operation, that most compresses should be placed on the projecting bone, and that the greatest pressure should be made there. There are certain physicians who make a show of superior skill by binding a heavy piece of lead on the part in order to depress the projecting bone, but this mode of treatment does not apply to the clavicle, for it is impossible to depress the projecting part to any extent worth mentioning. There are others who, knowing the fact that the bandages are apt to slip off, and that they do not keep the projecting parts in their place, apply compresses and bandages like the others, and then having girt the patient with a girdle, where it is usually applied with most effect, they make a heap of the compresses upon the projecting bone when they apply them, and having fastened the head of the bandage to the girdle in front, they apply it so as to bring the turns of it into the line of the clavicle, carrying them to the back, and then bringing them around the girdle they

² See the Plate at the end of the volume

carry them to the fore part and again backward There are others who do not apply the bandage round the girdle, but carry the rounds of it by the perineum and anus, and along the spine, so as to compress the fracture To an inexperienced person these methods will appear not far from natural, but when tied, they will be found of no service, for they do not remain firm any length of time, even if the patient keep his bed, although in this position they answer best, and yet even when lying in bed, should he bend his leg, or should his trunk be bent, all the bandages will be displaced, and, moreover, the bandaging is inconvenient, inasmuch as the anus is comprehended by it, and many turns of the bandage are crowded there in a narrow space And in the method with the girdle, the girdle cannot be so firmly girt around, but that the turns of the bandage force the girdle to ascend, and hence of necessity all the other bandages must be slackened He would seem to me to come nearest his purpose, although after all he effects but little, who would take a few turns round the girdle, but would use the bandage principally to secure the former bandaging, for in this manner the bandages would be most secure, and would mutually assist one another Every thing now almost has been said which applies to fracture of the clavicle But this also should be known, that in fractures of the clavicle, it is the part attached to the breast which is uppermost, and that the piece attached to the acromion is the lowermost The cause of this is, that for the most part the breast can neither be depressed nor raised, there being but a slight movement of the joint at the breast, for the sternum is connected together on both sides with the spine The clavicle admits of most motion at the joint of the shoulder, and this arises from its connection with the acromion And, moreover, when broken, the part which is connected with the sternum flies upward, and is not easily forced downward, for it is naturally light, and there is more room for it above than below But the shoulder, the arm, and the parts connected with them, are easily moved from the sides and breast, and, on that account, they admit of being considerably elevated and depressed When, therefore, the clavicle is broken, the fragment attached to the shoulder inclines downward, for it inclines much more readily

with the shoulder and arm downward than upward. Matters being as I have stated, they act imprudently who think to depress the projecting end of the bone. But it is clear that the under part ought to be brought to the upper, for the former is the movable part, and that which has been displaced from its natural position. It is obvious, therefore, that there is no other way of applying force to it (for the bandages no more force it to than they force it from), but if one will push the arm when at the sides as much as possible upward, so that the shoulder may appear as sharp as possible, it is clear that in this way it will be adjusted to the fragment of the bone connected with the breast from which it was torn. If one then will apply a bandage, *secundum artem*, for the purpose of promoting a speedy cure, and will reckon everything else of no value, except the position as described, he will form a correct opinion of the case, and will effect a cure in the speediest and most appropriate manner. It is of great importance, however, that the patient should lie in a recumbent posture. Fourteen days will be sufficient if he keep quiet, and twenty at most.

15 But if the clavicle be fractured in the opposite manner (which does not readily happen), so that the fragment of bone connected with the breast is depressed, while the piece connected with the acromion is raised up and rides over the other, this case does not require much management, for if the shoulder and arm be let go, the fragments of the bone will be adjusted to one another, and an ordinary bandage will suffice, and the callus will be formed in the course of a few days.

16 If the fracture be not thus, but if it incline either forward or backward, it may be restored to its natural position, by raising the shoulder with the arm as formerly described, and brought back to its natural place, when the cure will be speedily accomplished. Most of the varieties of displacement may be rectified by raising the arm upward. When the upper bone is displaced laterally or downward, it would favor the adaptation of the parts if the patient would lie on his back, and if some elevated substance were placed between the shoulder-blades, so that the breast may be depressed as much as possible upon the two sides, and if, while

another person raised the arm extended along the sides, the physician, applying the palm of the one hand to the head of the bone, would push it away, and with the other would adjust the broken bones, he would thus reduce the parts most readily to their natural position. But, as formerly stated, the upper bone (*sternal fragment*?) is rarely depressed downward. In most cases, after the bandages have been applied, that position is beneficial in which the elbow is fixed to the same side, and the shoulder is kept elevated, but in certain cases, the shoulder is to be raised, as has been directed, and the elbow is to be brought forward to the breast, and the hand laid on the acromion of the sound side. If the patient has the resolution to lie in bed, something should be placed so as to support the shoulder, and keep it as much elevated as possible. But if he walk about, the arm should be slung in a shawl, which embraces the point of the elbow, and is passed round the neck.

17 When the elbow-joint is displaced or dislocated to the side or outward, while its sharp point (*olecranon*?) remains in the cavity of the humerus, extension is to be made in a straight line, and the projecting part is to be pushed backward and to the side.

18 In complete dislocations toward either side, extension is to be made as in bandaging fracture of the arm, for thus the rounded part of the elbow will not form an obstacle to it. Dislocation, for the most part, takes place toward the sides (*inwardly*?). Reduction is to be effected by separating (the bones) as much as possible, so that the end (of the humerus) may not come in contact with the olecranon, and it is to be carried up, and turned round, and not forced in a straight line, and, at the same time, the opposite sides are to be pushed together, and propelled into their proper place. It will further assist if rotation of the fore-arm be made at the elbow, sometimes turning it into a supine position, and sometimes into a prone. The position for the treatment consists in keeping the hand a little higher than the elbow, and the arm at the sides, then it may either be suspended or laid at rest, for either position will answer, and nature and the usage of common means will accomplish the cure, if the callus does not form improperly. It is formed quickly. The treatment

is to be conducted with bandages according to the rule for bandaging articulations, and the point of the elbow is to be included in the bandage

19 Dislocations at the elbow give rise to the most serious consequences, such as fevers, pain, nausea, vomitings of pure bile, and more especially when the humerus is displaced backward from pressure on the nerve, which occasions numbness, next to it is the dislocation forward, the treatment is the same, reduction in dislocation backward is by extension and adaptation, the symptom of this variety—loss of the power of extension, of dislocation forward—loss of the power of flexion, and in this case reduction is to be accomplished by placing a hard ball (in the bend of the elbow), and bending the fore-arm about it, along with sudden extension

20 Diastasis of the bones may be recognized by examining the part where the vein that runs along the arm divides

21 In those cases callus is quickly formed In congenital dislocations the bones below the seat of the injury are shorter than natural, and, mostly, those nearest to the place, namely, the bones of the fore-arm, next those of the hand, and, third, those of the fingers The arm and shoulder are stronger, owing to the nourishment which they receive, and the other arm, from the additional work which it has to perform, is still more strong Wasting of the flesh takes place on the inside if the dislocation be on the outside, or otherwise, on the side opposite the dislocation

22 When the elbow is dislocated either inward or outward, extension is to be made with the fore-arm at a right angle to the arm, the arm, suspended by means of a shawl passed through the armpit, and a weight attached to the extremity of the elbow, or force may be applied with the hands, when the articular extremity has been cleared, the displaced parts are to be rectified with the palms of the hand, as in dislocations of the hands It is to be bandaged, suspended in a sling, and placed while in this attitude

23 Dislocations backward are to be rectified by the palms of the hands, along with sudden extension, the two acts are to be performed together, as in other cases of the kind But in dis-

location forward the arm is to be bent around a ball of cloth of proper size, and at the same time replaced

24 But if the displacement be on the other side, both these operations are to be performed in effecting the adjustment For conducting the treatment, the position and bandaging are the same as in the other cases But all these cases may be reduced by ordinary distention

25 Of the methods of reduction, some operate by raising up the part, some by extension, and some by rotation the last consists in rapidly turning the fore-arm to this side and that

26 The joint of the hand is dislocated either inward or outward, most frequently inward The symptoms are easily recognized: if inward, the patient cannot at all bend his fingers, and if outward, he cannot extend them With regard to the reduction,—by placing the fingers above a table, extension and counter-extension are to be made by other persons, while with the palm or heel of the hand on the projecting bone one pushes forward, and another from behind on the other bone, some soft substance is to be applied to it, and the arm is to be turned to the prone position if the dislocation was forward, but to the supine, if backward The treatment is to be conducted with bandages

27 The whole hand is dislocated either inward or outward, or to this side or that, but more especially inward, and sometimes the epiphysis is displaced, and sometimes the other of these bones is separated In these cases strong extension is to be applied, and pressure is to be made on the projecting bone, and counter-pressure on the opposite side, both at the same time, behind and at the side, with the hands upon a table, or with the heel These accidents give rise to serious consequences and deformities, but in the course of time the part gets strong, and admits of being used The cure is with bandages, which ought to embrace both the hand and fore-arm, and splints are to be applied as far as the fingers, and when they are used they should be more frequently unloosed than in fractures, and more copious affusions of water should be used

28 In congenital dislocations (at the wrist) the hand becomes

shortened, and the atrophy of the flesh occurs, for the most part, on the side opposite to the dislocation. In an adult the bones remain of their natural size.

29 Dislocation at the joint of a finger is easily recognized. Reduction is to be effected by making extension in a straight line, and applying pressure on the projecting bone, and counter-pressure on the opposite side of the other. The treatment is with bandages. When not reduced, callus is formed outside of the joint. When the dislocation takes place at birth, during adolescence the bones below the dislocation are shortened, and the flesh is wasted rather on the opposite than on the same side with the dislocation. When it occurs in an adult the bones remain of their proper size.

30 The jaw-bone, in few cases, is completely dislocated, for the zygomatic process formed from the upper jaw-bone (*malar*?) and the bone behind the ear (*temporal*?) shuts up the heads of the under jaw, being above the one (*condyloid process*?), and below the other (*coronoid process*?). Of these extremities of the lower jaw, the one, from its length, is not much exposed to accidents, while the other, the coronoid, is more prominent than the zygoma, and from both these heads nervous tendons arise, with which the muscles called temporal and masseter are connected, they have got these names from their actions and connections, for in eating, speaking, and the other functional uses of the mouth, the upper jaw is at rest, as being connected with the head by synarthrosis, and not by diarthrosis (*enarthrosis*?) but the lower jaw has motion, for it is connected with the upper jaw and the head by enarthrosis. Wherefore, in convulsions and tetanus, the first symptom manifested is rigidity of the lower jaw, and the reason why wounds in the temporal region are fatal and induce coma, will be stated in another place. These are the reasons why complete dislocation does not readily take place, and this is another reason, because there is seldom a necessity for swallowing so large pieces of food as would make a man gape more than he easily can, and dislocation could not take place in any other position than in great gaping, by which the jaw is displaced to either side. This circumstance, however, contrib-

utes to dislocation there, of nerves (*ligaments?*) and muscles around joints, or connected with joints, such as are frequently moved in using the member are the most yielding to extension, in the same manner as well-dressed hides yield the most With regard, then, to the matter on hand, the jaw-bone is rarely dislocated, but is frequently slackened (*partially displaced?*) in gaping, in the same manner as many other derangements of muscles and tendons arise Dislocation is particularly recognized by these symptoms the lower jaw protrudes forward, there is displacement to the opposite side, the coronoid process appears more prominent than natural on the upper jaw, and the patient cannot shut his lower jaw but with difficulty The mode of reduction which will apply in such cases is obvious one person must secure the patient's head, and another, taking hold of the lower jaw with his fingers within and without at the chin, while the patient gapes as much as he can, first moves the lower jaw about for a time, pushing it to this side and that with the hand, and directing the patient himself to relax the jaw, to move it about, and yield as much as possible, then all of a sudden the operator must open the mouth, while he attends at the same time to three positions for the lower jaw is to be moved from the place to which it is dislocated to its natural position, it is to be pushed backward, and along with these the jaws are to be brought together and kept shut This is the method of reduction, and it cannot be performed in any other way A short treatment suffices, a waxed compress is to be laid on, and bound with a loose bandage It is safer to operate with the patient laid on his back, and his head supported on a leather cushion well filled, so that it may yield as little as possible, but some person must hold the patient's head

31 When the jaw is dislocated on both sides, the treatment is the same The patients are less able to shut the mouth than in the former variety, and the jaw protrudes farther in this case, but is not distorted, the absence of distortion may be recognized by comparing the corresponding rows of the teeth in the upper and lower jaws In such cases reduction should be performed as quickly as possible, the method of reduction has been described

above If not reduced, the patient's life will be in danger from continual fevers, coma attended with stupor (for these muscles, when disordered and stretched preternaturally, induce coma), and there is usually diarrhœa attended with bilious, unmixed, and scanty dejections, and the vomitings, if any, consist of pure bile, and the patients commonly die on the tenth day

32 In fracture of the lower jaw, when the bone is not fairly broken across, and is still partially retained, but displaced, it should be adjusted by introducing the fingers at the side of the tongue, and making suitable counter-pressure on the outside, and if the teeth at the wound be distorted and loosened, when the bone is adjusted, they should be connected together, not only two, but more of them, with a gold thread, if possible, but otherwise, with a linen thread, until the bone be consolidated, and then the part is to be dressed with cerate, a few compresses, and a few bandages, which should not be very tight, but rather loose For it should be well known that in fracture of the jaw, dressing with bandages, if properly performed, is of little advantage, but occasions great mischief if improperly done Frequent examinations should be made about the tongue, and prolonged pressure should be applied with the fingers, in order to rectify the displaced bone It would be best if one could do so constantly, but that is impossible

33 But if the bone be fairly broken across (this, however, rarely happens), it is to be set in the manner now described When adjusted, the teeth are to be fastened together as formerly described, for this will contribute much toward keeping the parts at rest, especially if properly fastened, and the ends of the thread secured with knots But it is not easy to describe exactly in writing the whole manipulation of the case, but the reader must figure the thing to himself from the description given Then one must take a piece of Carthaginian leather, if the patient be a younger person, it will be sufficient to use the outer skin, but if an adult, the whole thickness of the hide will be required, it is to be cut to the breadth of about three inches, or as much as will be required, and having smeared the jaw with a little gum (for thus it sticks more pleasantly), the end of the skin is to be

fastened with the glue near the fractured part of the jaw, at the distance of an inch or a little more, from the wound. This piece is to be applied below the jaw, but the thong should have a cut in it, in the direction of the chin, so that it may go over the sharp point of the chin. Another piece of thong like this, or somewhat broader, is to be glued to the upper part of the jaw, at about the same distance from the wound as the other thong, this thong should be so cut as to encircle the ear. The thongs should be sharp-pointed at the part where they unite, and in gluing them, the flesh of the thong should be turned to the patient's skin, for in this way it will be more tenacious, then we must stretch this thong, but still more so the one at the chin, in order to prevent the fragments of the jaw from riding over each other, and the thongs are to be fastened at the vertex, and then a bandage is to be bound round the forehead, and a proper apparatus is to be put over all, to prevent the bandages from being displaced. The patient should lie upon the sound side of the jaw, not resting upon the jaw, but upon the head. He is to be kept on a spare diet for ten days, and then nourished without delay. If there be no inflammation during the first days, the jaw is consolidated in twenty days, for callus quickly forms in this, as in all the other porous bones, provided there be no sphacelus (*exfoliation*?) But much remains to be said on the sphacelus of bones in another place. This method of distention with glued substances is mild, of easy application, and is useful for many dislocations in many parts of the body. Those physicians who have not judgment combined with their dexterity, expose themselves in fractures of the jaws, as in other cases, for they apply a variety of bandages to a fractured jaw-bone, sometimes properly, and sometimes improperly. For all such bandaging of a fractured jaw-bone has a tendency rather to derange the bones connected with the fracture, than to bring them into their natural position.

34 But if the lower jaw be disjunct at its symphysis in the chin (there is but one symphysis in the lower jaw, but there are several in the upper, but I am unwilling to digress from the subject, as these matters will have to be touched upon in other kinds of disease)—if, then, the symphysis be separated at the chin, it

Works of Hippocrates

is the work which anybody can perform, to rectify it, for the part which protrudes is to be pushed inward by pressure with the fingers, and the part that inclines inward is to be forced outward by pushing with the fingers from within. It is after having applied extension to separate the fragments that this is to be done, for they will thus be more easily restored to their natural position, than if one should bring them together by using force. This is proper to be known as applying to all such cases. When you have set the parts, you must fasten the teeth on both sides to one another, as formerly directed. The treatment is to be accomplished with cerate, a few compresses, and bandages. This part, in particular, requires a short but complex (?) bandaging, for it is nearly cylindrical, though not exactly so, but the turn of the bandage is to be made, if the right jaw was dislocated, to the right hand (that is said to be to the right jaw when the right hand conducts the bandaging), but if the other jaw be the seat of the dislocation, the bandaging is to be made in the other direction. And if matters be properly adjusted, and the patient keep quiet, there will be a speedy recovery, and the teeth will be uninjured, but if not, the recovery will be more protracted, the teeth will be distorted, will give trouble, and become useless.

35 Of fractures of the nose there are more than one variety, but those who, without judgment, delight in fine bandagings, do much mischief, most especially in injuries about the nose. For this is the most complex of all the forms of bandaging, having most of the turns of the bandage called "ascia," and rhomboidal intervals and uncovered spaces of the skin. As has been said, those who practice manipulation without judgment are fond of meeting with a case of fractured nose, that they may apply the bandage. For a day or two, then, the physician glories in his performance, and the patient who has been bandaged is well pleased, but speedily the patient complains of the incumbrance of the bandage, and the physician is satisfied, because he has had an opportunity of showing his skill in applying a complex bandage to the nose. Such a bandaging does everything the very reverse of what is proper, for, in the first place, those who have their nose flattened by the fracture, will clearly have the part rendered

still more flat, if pressure above be applied to it, and further, those cases in which the nose is distorted to either side, whether at the cartilage or higher up, will evidently derive no benefit from bandaging above it, but will rather be injured, for it will not admit of having compresses properly arranged on either side of the nose, and indeed, persons applying this bandage do not seek to do this

36 This bandaging would appear to me to answer best when the skin surrounding the bone is contused on its ridge near the middle, or if the bone itself have sustained some injury, but not a great one, in such cases, redundant callus forms in the nose, and the part becomes a little too prominent, and yet, even in these cases, the bandaging need not require much trouble, if, indeed, any bandage be applied at all, for it is enough if one lay a waxed compress on the contusion, and then apply the double-headed bandage, thus taking one turn with it. The best application to such accidents is a small cataplasm of wheaten flour, washed, and mixed up into a viscid mass. If the flour be made from good wheat, and if it be glutinous, it should be used alone for all such cases, but if it be not very glutinous, a little of the manna of frankincense, well pulverized, is to be moistened with water, and the flour is to be mixed up with it, or a very little gum may be mixed in like manner

37 In those cases in which the fractured portions are depressed and flattened, if it is depressed in front at the cartilage, something may be introduced into the nostrils to rectify the parts. If not, all such deformities may be restored by introducing the fingers into the nostrils, if this can be managed, but if not, a thick spatula is to be introduced with the fingers, not to the fore part of the nose, but to the depressed portion, and the physician is to take hold of the nose externally on both sides, and at the same time raise it up. And if the fracture be much in the fore part one may introduce into the nostrils as already stated, either caddis scraped from a linen towel, or something such wrapped up in a piece of cloth, or rather stitched in Carthaginian leather, and moulded into a shape suitable to the place into which it is to be introduced. But if the fracture be at a greater distance, it is

not possible to introduce anything within, for if it was irksome to bear anything of the kind in the fore part, how is it not to be so when introduced farther in? At first, then, by rectifying the parts from within, and sparing no pains upon them from without, they are to be brought to their natural position, and set A fractured nose may be readily restored to shape, especially on the day of the accident, or even a little later, but the physicians act irresolutely, and touch it more delicately at first than they should, for the fingers should be applied on both sides along the natural line of the nose, and it is to be pushed downward, and thus, with pressure from within, the displacement is to be rectified But for these purposes no physician is equal to the index-fingers of the patient himself, if he will pay attention and has resolution, for they are the most natural means Either of the fingers is to be placed firmly along the whole nose, and thus it is to be gently held, and steadily, if possible until it become firm, but if not, he himself is to hold it for as long a time as possible, in the manner described, or if he cannot, a child or woman should do it, for the hands ought to be soft. Thus may a fracture of the nose, attended with depression, and not with displacement to the side, but in a straight line, be most properly treated I have never seen a case of fractured nose which could not be rectified when attempted, before callus is formed, provided the treatment be properly applied But although men would give a great price to escape being deformed, yet at the same time they do not know how to take care, nor have resolution, if they do not experience pain, nor fear death, although the formation of callus in the nose speedily takes place, for the most part is consolidated in ten days, provided sphacelus do not take place

38 When the fractured bone is displaced laterally, the treatment is the same, but it is obvious that the reduction is to be made, not by applying equal force on both sides, but by pushing the displaced portion into its natural position, and pressing on it from without, and introducing something into the nostrils, and boldly rectifying the fragments which incline inward, until the whole be properly adjusted, well knowing that if you do not restore the parts at once, it is impossible but that the nose must

be distorted But when you restore the parts to their natural position, either the patient himself, or some other person, is to apply one finger or more to the part which protrudes, and keep it in position until the fracture be consolidated, but the little finger is, from time to time, to be pushed into the nostril, to rectify the parts which incline inward When any inflammation supervenes, dough must be used, but attention must still be equally paid to the application of the fingers, although the dough be on the part But if the fracture be in the cartilage, with lateral displacement, the end of the nose must necessarily be distorted In such cases some of the aforementioned means of reduction, or whatever suits, is to be introduced into the nostril, but there are many convenient things to be found which have no smell, and are appropriate in other respects, thus, on one occasion, I introduced a slice of sheep's lung, as it happened to be at hand, for sponges, if introduced, imbibe humidities Then the outer skin of Carthaginian leather is to be taken, and a piece of the size of the thumb, or what will answer, is to be cut off and glued to the outside of the nostril which is turned aside, and then this piece of thong is to be stretched to the proper degree, or rather a little more than what will be sufficient to make the nose straight and regular Then (for the thong must be long) it is to be brought below the ear and round the head, and the end of the thong may either be glued to the forehead, or a still longer one may be carried all round the head, and secured This is a natural mode of setting the nose, is of easy application, and is calculated to enable the counter-extension on the nose to be made greater or less, as you may incline In a case where the fractured nose is turned to the side, the treatment is to be conducted otherwise, as already described, and in most of them the thong ought to be glued to the end of the nose, in order to make extension in the opposite direction

39 When the fracture is complicated with a wound, one need not be troubled on that account, but pitch-cerate or any of the applications for fresh wounds is to be applied to the sores, for, in general, they admit of easy cure, even when there is reason to apprehend that pieces of bone will come out The parts, at first,

are to be adjusted fearlessly, taking care that nothing is omitted, and, subsequently, they are also to be adjusted with the fingers, more softly, indeed, but still it must be done, and of all parts of the body the nose is modeled with the greatest ease. And there is nothing to prevent us from having recourse to the practice of gluing on the thongs, and drawing the nose to the opposite side, even if there be a wound or the parts be inflamed, for these thongs give no pain.

40 In fractures of the ear all sorts of bandages do harm. For one would not think of applying it quite loose, and if applied more tightly, it only does the more harm, for even the sound ear, when confined with a bandage, becomes painful, throbs, and gets into a febrile state. With regard to cataplasms, the heaviest, on the whole, are the worst, but almost all kinds are bad, form abscesses, occasion an increase of humors, and afterward troublesome suppurations, and a fractured ear stands in less need of such applications than any other part, the most ready, if required, is the paste of meal, but neither should it have weight. It should touch as little as possible, for it is a good remedy sometimes it apply nothing at all, both to the ear and to many other cases. Attention must be paid to the patient's position during sleep. And the body must be reduced, more especially if there be danger lest the ear suppurate, it will also be better to open the bowels, and if the patient can be readily made to vomit, this may be accomplished by means of the *symptomism*. If the part come to suppuration, it should not be hastily opened, for often when matter appears to be formed it is absorbed again, even when no cataplasm is applied. But if forced to open it, the part will get soonest well if transfixed with a cautery, and yet it should be well understood that the ear gets maimed, and is less than the other if burned through. If not burned through, an incision, and not a very small one, should be made on the upper side, for the pus is found to be surrounded with a thicker covering than one would have supposed, and it may be said, in general, that all parts of a mucous nature and which form mucus, as being all viscid, when touched, slip from below the fingers to either side, and on that account the physician, in such cases, finds that he has to pass his

instrument through a thicker substance than he supposed, and in certain ganglionic cases, when the skin is flabby and mucous, many physicians open them, expecting to find a collection in them, here the physician forms a wrong judgment, but by such a procedure no great harm results to the patient from having had the part opened. But with regard to watery parts, and such as are filled with mucus, and which are situated in regions where every one of the parts, if opened, will occasion death or some other injury, these will be treated of in another work. When, therefore, incision is made in the ear, all sorts of cataplasms and pledges should be avoided, and it is to be treated either with applications for recent wounds, or anything else which is neither heavy nor will occasion pain, for if the cartilage be laid bare and abscesses form, the case will be troublesome, this happens from such modes of treatment. In all aggravated cases, the most effectual remedy is the transfixing of the part with a hot iron.

41 The vertebræ of the spine when contracted into a hump behind from disease, for the most part cannot be remedied, more especially when the gibbosity is above the attachment of the diaphragm to the spine. Certain of those below the diaphragm are carried off by varices in the legs, more especially by such as occur in the vein at the ham, and in those cases where the gibbosities are removed, the varices take place also in the groin, and some have been carried off by a dysentery when it becomes chronic. And when the gibbosity occurs in youth before the body has attained its full growth, in these cases the body does not usually grow along the spine, but the legs and the arms are fully developed, whilst the parts (about the back) are arrested in their development. And in those cases where the gibbosity is above the diaphragm, the ribs do not usually expand properly in width, but forward, and the chest becomes sharp-pointed and not broad, and they become affected with difficulty of breathing and hoarseness, for the cavities which inspire and expire the breath do not attain their proper capacity. And they are under the necessity of keeping the neck bent forward at the great vertebra, in order that their head may not hang downward, this, therefore, occasions great contraction of the pharynx by its

inclination inward, for, even in those who are erect in stature, dyspnœa is induced by this bone inclining inward, until it be restored to its place. From this frame of body, such persons appear to have more prominent necks than persons in good health, and they generally have hard and unconcocted tubercles in the lungs, for the gibbosity and the distension are produced mostly by such tubercles, with which the neighboring nerves communicate. When the gibbosity is below the diaphragm, in some of these cases nephritic diseases and affections of the bladder supervene, but abscesses of a chronic nature, and difficult to cure, occur in the loins and groins, and neither of these carries off the gibbosity, and in these cases the hips are more emaciated than when the gibbosity is seated higher up, but the whole spine is more elongated in them than in those who have the gibbosity seated higher up, the hair of the pubes and chin is of slower growth and less developed, and they are less capable of generation than those who have the gibbosity higher up. When the gibbosity seizes persons who have already attained their full growth, it usually occasions a crisis of the then existing disease, but in the course of time some of them attack, as in the case of younger persons, to a greater or less degree; but, for the most part, all these diseases are less malignant. And yet many have borne the affection well, and have enjoyed good health until old age, more especially those persons whose body is inclined to be plump and fat, and a few of them have lived to beyond sixty years of age, but the most of them are more short-lived. In some cases the curvature of the spine is lateral, that is to say, either to the one side or the other, the most of such cases are connected with tubercles (*abscesses*?) within the spine, and in some, the positions in which they have been accustomed to lie co-operate with the disease. But these will be treated of among the chronic affections of the lungs, for these the most suitable prognostics of what will happen in these cases are given.

42 When the spine protrudes backward, in consequence of a fall, it seldom happens that one succeeds in straightening it. Wherefore succussion on a ladder has never straightened anybody, as far as I know, but it is principally practiced by those

physicians who seek to astonish the mob—for to such persons these things appear wonderful, for example, if they see a man suspended or thrown down, or the like, and they always extol such practices, and never give themselves any concern whatever may result from the experiment, whether bad or good. But the physicians who follow such practices, as far as I have known them, are all stupid. The device, however, is an old one, and I give great praise to him who first invented this, and any other mechanical contrivance which is according to nature. For neither would I despair, but that if succussion were properly gone about, the spine, in certain cases, might be thereby rectified. But, indeed, for my own part, I have been ashamed to treat all such cases in this way, because such modes of procedure are generally practiced by charlatans.

43 Those cases in which the gibbosity is near the neck, are less likely to be benefited by these succussions with the head downward, for the weight of the head, and tops of the shoulders, when allowed to hang down, is but small, and such cases are more likely to be made straight by succussion applied with the feet hanging down, since the inclination downward is greater in this way. When the hump is lower down, it is more likely in this case that succussion with the head downward should do good. If one, then, should think of trying succussion, it may be applied in the following manner—The ladder is to be padded with leather linen cushions, laid across, and well secured to one another, to a somewhat greater extent, both in length and breadth, than the space which the man's body will occupy, he is then to be laid on the ladder upon his back, and the feet, at the ankles, are to be fastened, at no great distance from one another, to the ladder, with some firm but soft band, and he is further to be secured, in like manner, both above and below the knee, and also at the nates, and at the groins and chest loose shawls are to be put round in such a fashion as not to interfere with the effect of the succussion, and his arms are to be fastened along his sides to his own body, and not to the ladder. When you have arranged these matters thus, you must hoist up the ladder, either to a high tower or to the gable-end of a house, but the place where you make the

succussion should be firm, and those who perform the extension should be well instructed, so that they may let go their hold equally to the same extent, and suddenly, and that the ladder may neither tumble to the ground on either side, nor they themselves fall forward. But, if the ladder be let go from a tower, or the mast of a ship, fastened into the ground with its cordage, it will be better, so that the ropes run upon a pulley or axle-tree. But it is disagreeable even to enlarge upon these matters, and yet, by the contrivances now described, the proper succussion may be made.

44 But if the hump be situated very high up, and if succussion be by all means to be used, it will be better to do it with the feet downward, as has been said, for the force downward will be the greater in this case. The patient is to be well fastened to the ladder by cords at the breast, at the neck by means of a very loose shawl so as merely to keep the part properly on the ladder, and the head is to be fastened to the ladder at the forehead, the arms are to be stretched along and attached to the patient's body, and not to the ladder, and the rest of the body is not to be bound, except so as to keep it in place by means of a loose shawl wrapped round it and the ladder, attention, moreover, should be paid that these ligatures do not interfere with the force of the succussion, and the legs are not to be fastened to the ladder, but should be placed near one another, so as to be in line with the spine. These matters should be thus arranged, if recourse is to be had at all to succussion on a ladder, for it is disgraceful in every art, and more especially in medicine, after much trouble, much display, and much talk, to do no good after all.

45 In the first place, the structure of the spine should be known, for this knowledge is requisite in many diseases. Wherefore, on the side turned to the belly (*the anterior?*) the vertebræ are in a regular line, and are united together by a pulpy and nervous band of connection, originating from the cartilages, and extending to the spinal marrow. There are certain other nervous cords which decussate, are attached (*to the vertebræ?*), and are extended from both sides of them. But we will describe in another work the connections of the veins and arteries, their

numbers, their qualities, their origin, their functional offices in particular parts, in what sort of sheaths the spinal marrow is inclosed, where they arise, where they terminate, how they communicate, and what their uses. On the opposite side (*behind*?) the vertebræ are connected together by a ginglymoid articulation. Common cords (*nerves*?) are extended to all parts, both those within and without. There is an osseous process from the posterior part of all and each of the vertebræ, whether greater or smaller, and upon these processes there are cartilaginous epiphyses, and from them arise nervous productions (*ligaments*?), akin to the external nerves (*ρόνοι*). The ribs are united to them, having their heads inclined rather to the inside than the out, and every one of them is articulated with the vertebræ, and the ribs in man are very curved, and, as it were, arched. The space between the ribs and the processes of the vertebræ is filled on both sides by muscles, which arise from the neck and extend to the loins (?). The spine, longitudinally, is a straight line slightly curved, from the os sacrum to the great vertebra which is connected with the articulation of the femur, the spine inclines backward, for the bladder, the organs of generation, and the loose portion of the rectum, are situated there. From this, to the attachment of the diaphragm, the spine inclines inward, and this portion alone, from the internal parts, gives origin to muscles, which are called *psoæ*. From this to the great vertebra (*seventh cervical*?) which is above the tops of the shoulders, it is convex behind lengthways, but it is more in appearance than it really is, for the spinous processes are highest in the middle, and less so above and below. The region of the neck is convex before.

46 In cases of displacement backward along the vertebræ, it does not often happen, in fact, it is very rare, that one or more vertebræ are torn from one another and displaced. For such injuries do not readily occur, as the spine could not easily be displaced backward but by a severe injury on the fore part through the belly (which would prove fatal), or if a person falling from a height should pitch on the nates, or shoulders (and even in this case he would die, but not immediately), and it also would not readily happen that such a displacement could take place

forward, unless some very heavy weight should fall upon it behind, for each of the posterior spinal processes is so constructed, that it would sooner be broken than undergo any great inclination forward from a force which would have to overcome the ligaments and the articulations mutually connecting them. And the spinal marrow would suffer, if from the displacement of a vertebra it were to be bent even to a small extent; for the displaced vertebra would compress the spinal marrow, if it did not break it, and if compressed and strangled, it would induce insensibility of many great and important parts, so that the physician need not give himself any concern about rectifying the displacement of the vertebra, accompanied, as it is, by many other ill consequences of a serious nature. It is evident, then, that such a case could not be reduced either by succussion or by any other method, unless one were to cut open the patient, and then, having introduced the hand into one of the great cavities, were to push outward from within, which one might do on the dead body, but not at all on the living. Wherefore, then, do I write all this? Because certain persons fancy that they have cured patients in whom the vertebra had undergone complete dislocation forward. Some, indeed, suppose that this is the easiest of all these dislocations to be recovered from, and that such cases do not stand in need of reduction, but get well spontaneously. Many are ignorant, and profit by their ignorance, for they obtain credit from those about them. These are deceived in this way, for they suppose the spinous processes to be the vertebræ themselves, because every one of them appears round to the touch, not knowing that these bones are processes from the vertebræ, as formerly stated, but the vertebræ are at a considerable distance before them, for of all animals, man, in proportion to his bulk, has the belly (*internal cavity*?) the narrowest from behind to before, especially at the breast. When, therefore, any of these processes are severely fractured, whether one or more, the part there appears lower than on either side, and for that reason they are deceived, supposing that the vertebræ are displaced inward. And the attitudes of the patient contribute also to deceive them; for if they attempt to put themselves into a bent position, they

are pained, from the skin being stretched at the seat of the injury, and at the same time the fragments of the bones wound the skin still more, but if they bend forward, they feel easier, for the skin at the wound is thus relaxed, and the bones are less disposed to hurt them, and if touched, they shrink and bend forward, and the part which is touched appears empty and soft. All the circumstances now mentioned contribute to deceive the physician. Such patients speedily get well without any bad effects, for callus readily forms in all such bones as are porous.

47 There are many varieties of curvature of the spine even in persons who are in good health, for it takes place from natural conformation and from habit, and the spine is liable to be bent from old age, and from pains. *Gibbosities* (or projections backward) from falls generally take place when one pitches on the nates, or falls on the shoulders. In this case some one of the vertebræ must necessarily appear higher than natural, and those on either side to a less degree, but yet no one generally has started out of the line of the others, but every one has yielded a little, so that a considerable extent of them is curved. On this account the spinal marrow easily bears such distortions, because they are of a circular shape, and not angular. The apparatus for the reduction in this case must be managed in the following manner: a strong and broad board, having an oblong furrow in it, is to be fastened in the ground, or, in place of the board, we may scoop out an oblong furrow in the wall, about a cubit above the floor, or at any suitable height, and then something like an oaken bench, of a quadrangular shape, is to be laid along (the wall?) at a distance from the wall, which will admit of persons to pass round if necessary, and the bench is to be covered with robes, or anything else which is soft, but does not yield much, and the patient is to be stoved with vapor, if necessary, or bathed with much hot water, and then he is to be stretched along the board on his face, with his arms laid along and bound to his body, the middle, then, of a thong which is soft, sufficiently broad and long, and composed of two cross straps of leather, is to be twice carried along the middle of the patient's breast, as near the armpits as possible, then what is over of the thongs at the armpits is

to be carried round the shoulders, and afterward the ends of the thong are to be fastened to a piece of wood resembling a pestle, they are to be adapted to the length of the bench laid below the patient, and so that the pestle-like piece of wood resting against this bench may make extension. Another such band is to be applied above the knees and the ankles, and the ends of the thongs fastened to a similar piece of wood, and another thong, broad, soft, and strong, in the form of a swathe, having breadth and length sufficient, is to be bound tightly round the loins, as near the hips as possible, and then what remains of this swathe-like thong, with the ends of the thongs, must be fastened to the piece of wood placed at the patient's feet, and extension in this fashion is to be made upward and downward, equally and at the same time, in a straight line. For extension thus made could do no harm, if properly performed, unless one sought to do mischief purposely. But the physicians, or some person who is strong, and not uninstructed, should apply the palm of one hand to the hump, and then, having laid the other hand upon the former, he should make pressure, attending whether this force should be applied directly downward, or toward the head, or toward the hips. This method of applying force is particularly safe, and it is also safe for a person to sit upon the hump while extension is made, and raising himself up, to let himself fall again upon the patient. And there is nothing to prevent a person from placing a foot on the hump, and supporting his weight on it, and making gentle pressure, one of the men who is practiced in the palestra would be a proper person for doing this in a suitable manner. But the most powerful of the mechanical means is this: if the hole in the wall, or in the piece of wood fastened into the ground, be made as much below the man's back as may be judged proper, and if a board, made of lime-tree, or any other wood, and not too narrow, be put into the hole, then a rag, folded several times or a small leather cushion, should be laid on the hump, nothing large, however, should be laid on the back, but just as much as may prevent the board from giving unnecessary pain by its hardness, but the hump should be as much as possible on a line with the hole made in the wall, so that the board introduced into it may

make pressure more especially at that spot. When matters are thus adjusted, one person, or two if necessary, must press down the end of the board, whilst others at the same time make extension and counter-extension along the body, as formerly described. Extension may also be made with axles, which may either be fastened in the ground beside the bench, or the post of the axles may be attached to the bench itself, if you will make them perpendicular and overtopping (*the bench?*) a little at both ends, or at either end of the bench. These powers are easily regulated, so as to be made stronger or weaker, and they are of such force, that if one were to have recourse to them for a mischievous purpose, and not as a remedy, they would operate strongly in this way also, for by making merely extension and counter-extension longitudinally, without any additional force, one might make sufficient extension, and if, without making extension at all, one were only to press down properly with the board, sufficient force might be applied in this way. Such powers, then, are excellent which admit of being so regulated, that they can be made weaker and stronger as required. And the forces are applied in the natural way, for the pressure above forces the displaced parts into their place. Natural extension restores parts which have come too near one another to their natural position. I, then, am acquainted with no powers which are better or more appropriate than these, for extension along the spine downward has no proper hold at the bone called the os sacrum, and extension upward, along the neck and head, has indeed a hold, but extension thus made is unseemly to behold, and, besides, if increased, may occasion much mischief otherwise. I once made trial of the following plan. Having placed the patient on his back, I put below the hump a bladder, not inflated, and afterward introduced air into the bladder by means of a brass pipe connected with it. But the experiment did not succeed, for, when the man was fairly extended, the bladder yielded, and the air could not be forced into it, and, besides, the hump of the patient was apt to slip off the distended bladder when they were pressed together. But when I did not extend the man strongly, the bladder was swelled up by the air, and the man became more bent forward.

than proper I have written this expressly; for it is a valuable piece of knowledge to learn what things have been tried and have proved ineffectual, and wherefore they did not succeed.

48 In curvatures forward of the vertebræ from a fall, or from some heavy body falling upon them, in general no one of them is displaced far beyond the others, but if one or more be so displaced, the case proves fatal, but, as formerly stated, the displacement is circular, and not angular. In such cases, then, the urine and fæces are more apt to be retained than in displacement outward, the feet and the whole inferior extremities are colder, and the symptoms are more fatal than in the former case, and if they do survive, they are more subject to retention of the urine, and to loss of strength, and to torpor in their legs. But if the displacement be in the upper part, they experience loss of strength and torpor of the whole body. I know no mechanical contrivance by which such a displacement could be reduced, unless that one might be benefited by succussion on a bladder, or any other similar plan of treatment, such as extension, as formerly described. I am not aware of any mode of pressure which might be applied along with the extension, like that of the board in displacement backward, for how could one apply pressure from before through the belly? (*internal cavity*?) The thing is impossible. But neither coughing nor sneezing has any power so as to co-operate with the extension, nor would the injection of air into the bowels have any effect. And to apply large cupping instruments with the view of drawing back the vertebræ which have protruded forward, shows a great error of judgment, for they rather propel than attract, and those who apply them are not aware even of this fact, for the greater will be the inclination forward the greater the instrument applied, the skin being forcibly drawn into the cupping-instrument. I could tell of other modes of succussion than those formerly described, which one might fancy would be more applicable in such an affection, but I have no great confidence in them, and therefore I do not describe them. On the main, it should be known, respecting the accidents which I have briefly described, that displacements forward are of a fatal and injurious nature, but that displacements backward,

for the most part, do not prove fatal, nor occasion retention of urine nor torpor of the limbs, for they do not stretch the ducts leading toward the intestines, nor occasion obstruction of the same, but displacements forward produce both these bad effects, and many others in addition. And truly they are more apt to lose the power of their legs and arms, to have torpor of the body, and retention of urine, who experience no displacement either forward or backward, but merely a violent concussion along the spine, while those who have displacement backward are least subject to these symptoms.

49 And one might observe many other instances in medicine, of considerable injuries not proving serious, but producing a crisis in some affection, while less considerable injuries prove more serious, give rise to chronic diseases, and extend their effects to the whole system. Now something similar may happen in fracture of the ribs, for in fracture of one or more ribs, in general, if the fractured bones are not driven inward, nor are laid bare, fever rarely supervenes, neither does it often happen that there is hæmoptysis, empyema, and suppurating sores, which require treatment with pledgets, nor necrosis of the bones, and in these cases the ordinary regimen is sufficient. For, unless they be seized with continual fever, a strict diet does more harm than good, by inducing inanition, and increasing the pain, fever, and cough, for moderate fullness of the intestines has a tendency to replace the ribs, while evacuation leads to suspension of the ribs, and suspension induces pain. Ordinary bandaging, externally, is sufficient in such cases, the bandages should be applied moderately tight, along with cerate and compresses, or a pad of wool may be applied. The rib is consolidated in twenty days, for callus soon forms in such bones.

50 But when there is contusion of the flesh about the ribs, either from a blow, or a fall, or a bruise, or any like cause, there is often copious vomiting of blood, for there are canals stretched along the vacuity of each rib (*intercostal space*²), and nerves proceeding from the most important parts of the body have their origin there. Many of these, therefore, are troubled with coughs, tubercles, empyema, external suppurations, and sphacelus of the

ribs And even when no such symptoms supervene from contusion of the skin about the ribs, still in such cases there is, generally, more combined pain than in fractures of the ribs, and relapses of pain in the seat of the injury are more apt to occur Wherefore some physicians pay much less attention to such injuries, than where the rib is fractured, whereas, if they were wise, they would treat such cases with far greater care than the other, for it is proper that the diet should be restricted, that the patients should remain at rest as much as possible, and abstain from venery, from fat articles of food, from such as excite cough, and from everything strong, they should be bled in the arm, speak as little as possible, should have the contused part bound round with folded compresses, plenty of bandages, broader than the contusion, and which should be smeared with cerate, in applying the bandages, broad and soft shawls should be used, and they should be put on moderately firm, so that the patient will say that they are neither too tight nor loose, and the bandaging should commence at the seat of the injury, and be made more particularly tight there, and the bandaging should be conducted as is done with a double-headed roller, so that the skin about the ribs may not be ruffled, but may lie smooth, and the bandaging should be renewed every day, or every alternate day It is better also to open the bowels with some gentle medicine, so as just to produce an evacuation of the food, and the diet is to be restricted for ten days, and then the body is to be recruited and filled up, while you are upon the reducing system, the bandaging should be tighter, but when you are making him up again, it must be looser, and, if he spit blood from the commencement, the treatment and bandaging should be continued for forty days, but if there be no hæmoptysis, treatment for twenty days will generally be sufficient, but the length of time must be regulated by the magnitude of the injury When such contusions are neglected, if no greater mischief result therefrom, at all events the bruised part has its flesh more pulpy than it had formerly When, therefore, any such thing is left behind, and is not properly dissipated by the treatment, it will be worse if the mucosity be lodged near the bone, for the flesh no longer adheres to the bone

as formerly, the bone becomes diseased, and chronic sloughings of the bone in many cases arise from such causes. But if the mischief be not upon the bone, but it is the flesh itself which is pulpy, relapses and pains will return from time to time, if there happen to be any disorder in the body, wherefore proper bandaging, and for a considerable time, must be had recourse to, until the extravasated blood forming in the bruise be dried up and absorbed, and the part be made up with sound flesh, and the flesh adhere to the bone. The best cure is the cautery in those cases which, from neglect, have become chronic, and the place turns painful, and the flesh is pulpy. And when the flesh itself is pulpy, the burning should be carried as far as the bone, but the bone itself should not be heated, but if it be in the intercostal space, you need not make the burning so superficial, only you must take care not to burn quite through. But if the contusion appear to be at the bone, if it be still recent, and the bone has not yet become necrosed, if it be very small, it is to be burned as has been described, but if the rising along the bone be oblong, several eschars are to be burned over it. Necrosis of the rib will be described along with the treatment of suppurating sores.

51 There are four modes of dislocation at the hip-joint of which modes, dislocation inward takes place most frequently, outward, the most frequently of all the other modes, and it sometimes takes place backward and forward, but seldom. When, therefore, dislocation takes place inward, the leg appears longer than natural, when compared with the other leg, for two reasons truly, for the bone which articulates with the hip-joint is carried from above down to the ischium where it rises up to the pubes, upon it, then, the head of the femur rests, and the neck of the femur is lodged in the cotyloid foramen (*foramen thyroideum*?) The buttock appears hollow externally, from the head of the thigh-bone having shifted inward, and the extremity of the femur at the knee is turned outward, and the leg and foot in like manner. The foot then being turned outward, physicians, from ignorance, bring the sound leg to it and not it to the sound leg, on this account, the injured limb appears to be much longer than the sound one, and in many other cases similar circumstances

lead to error in judgment Neither does the limb at the groin admit of flexion as in the sound limb, and the head of the bone is felt at the perineum too prominent These, then, are the symptoms attending dislocation of the thigh inward

52 When, then, a dislocation has not been reduced, but has been misunderstood or neglected, the leg, in walking, is rolled about as is the case with oxen, and the weight of the body is mostly supported on the sound leg, and the limb at the flank, and the joint where the dislocation has occurred is necessarily hollow and bent, while on the sound side the buttock is necessarily rounded For if one should walk with the foot of the sound leg turned outward, the weight of the body would be thrown upon the injured limb, but the injured limb could not carry it, for how could it? One, then, is forced in walking to turn the leg inward, and not outward, for thus the sound leg best supports its own half of the body, and also that of the injured side But being hollow at the flank and the hip-joint, they appear small in stature, and are forced to rest on a staff at the side of the sound leg For they require the support of a staff there, since the nates inclines to this side, and the weight of the body is carried to it They are forced also to stoop, for they are obliged to rest the hand on the side of the thigh against the affected limb, for the limb which is injured cannot support the body in changing the legs, unless it be held when it is applied to the ground They who have got an unreduced dislocation inward are forced to put themselves into these attitudes, and this from no premeditation on their part how they should assume the easiest position, but the impediment itself teaches them to choose that which is most conformable to their present circumstances For persons who have a sore on the foot, or leg, and cannot rest upon the limb, all, even children, walk in this way, for they turn the injured limb outward in walking, and they derive two advantages therefrom, to supply two wants, the weight of the body is not equally thrown upon the limb turned outward, as upon the one turned inward, for neither is the weight in a line with it, but is much more thrown upon the one under the body, for the weight is in a straight line with it, both in walking and in the shifting of the legs In this

position one can most quickly turn the sound limb under the body, by walking with the unsound limb outward, and the sound inward. In the case we are now treating of, it is well that the body finds out the attitudes which are the easiest for itself. Those persons, then, who have not attained their growth at the time when they met with a dislocation which is not reduced, become maimed in the thigh, the leg, and the foot, for neither do the bones grow properly, but become shortened, and especially the bone of the thigh; and the whole limb is emaciated, loses its muscularity, and becomes enervated and thinner, both from the impediment at the joint, and because the patient cannot use the limb, as it does not lie in its natural position, for a certain amount of exercise will relieve excessive enervation, and it will remedy in so far the deficiency of growth in length. Those persons, then, are most maimed who have experienced the dislocation *in utero*, next those who have met with it in infancy, and least of all, those who are full grown. The mode of walking adopted by adults has been already described, but those who are children when this accident befalls them, generally lose the erect position of the body, and crawl about miserably on the sound leg, supporting themselves with the hand of the sound side resting on the ground. Some, also, who had attained manhood before they met with this accident, have also lost the faculty of walking erect. Those who were children when they met with the accident, and have been properly instructed, stand erect upon the sound leg, but carry about a staff, which they apply under the armpit of the sound side, and some use a staff in both arms, the unsound limb they bear up, and the smaller the unsound limb, the greater facility have they in walking, and their sound leg is no less strong than when both are sound. The fleshy parts of the limb are enervated in all such cases, but those who have dislocation inward are more subject to this loss of strength than, for the most part, those who have it outward.

53 Some tell a story how the Amazonian women dislocate the joints of their male children while mere infants, some at the knee, and others at the hip-joint, that they may be maimed, and that the male sex may not conspire against the female, and that

they use them as artisans to perform any sedentary work, such as that of a shoemaker or brazier. Whether these things be true or not I do not know, but this I know, that matters would be such as is represented, provided their children, while infants, were to have their joints dislocated. The consequences of dislocation inward at the hip-joint are much greater than of dislocation outward at the hip-joint, but at the knee, although there be some difference, it is less, but the mode of either impediment is peculiar, their legs are more bandied when the dislocation is outward, but those who have dislocation inward stand erect on their feet with less freedom. In like manner, when the dislocation is at the ankle-joint, if outward they become *vari* (*their toes are turned inward?*), but they can stand, but if the dislocation be inward they become *valgi* (*their toes are turned outward?*), but they have less freedom of standing. The proportional growth of their bones is as follows in those cases in which the bone of the leg is dislocated, the bones of the feet grow very little, as being very near the injury, but the bones of the leg increase in size, and with very little defect, but the fleshy parts (*muscles?*) are wasted. But when the ankle-joint is in its natural state, but the knee is dislocated, in these cases the bones of the leg do not grow in like manner, but become shortened, as being nearest the seat of the injury, and the bones of the feet also are atrophied, but not in the same proportion, because, as was said a little while ago, the ankle-joint is safe, and if they could use it, as in the case of club-foot, the bones of the foot would be still less atrophied. When the dislocation takes place at the hip-joint, the bone of the thigh, in this case, does not generally grow in like manner, as being the one nearest the seat of the injury, but becomes shorter than the sound one, but the growth of the bones of the leg is not arrested in like manner, nor of those of the feet, for this reason, that there is no displacement between the bones of the thigh and leg, nor between those of the leg and foot, in those cases, however, the fleshy parts of the whole limb are atrophied, but if they could make use of the limb, the growth of the bones would be still more developed, as formerly stated, only the thigh, although its flesh would be much less wasted, would

still be by no means so fleshy as the sound limb The following observations are a proof of this those persons who are weasel-armed (*galiancones*) from birth, owing to dislocation of the humerus, or when the accident has happened to them before they have attained their full growth, such persons have the bone of the arm shortened, but those of the fore-arm and hand are little inferior in size to the sound, for the reasons which have been stated, because the humerus is the bone nearest to the joint affected, and, on that account, it is shorter than natural, but the fore-arm is not equally affected by the accident, because the joint at which the bones of the arm and fore-arm are articulated remains in its natural condition, and the hand is still further distant than the fore-arm from the seat of the injury Such are the reasons why certain of the bones in this case increase in growth, and certain do not The laborious office of the hand contributes much to the development of the flesh in the fore-arm and hand, for whatever work is done by the hand, these weasel-armed persons strive to do no less effectually with the other hand than with the sound, for the arms do not support the weight of the body like the legs, and the work performed by them is light From exercise, then, the fleshy parts on the hand and fore-arm are not atrophied in weasel-armed persons, and by these means the arm, too, gains flesh But in dislocation inward at the hip-joint, whether from birth or from childhood, the fleshy parts, on that account, are much more atrophied than those of the hand, because the patients cannot exercise the leg Another proof will be given in the observations which will be presently stated, that these things are such as I have represented

54 When the head of the femur is dislocated outward, the limb in these cases, when compared with the other, appears shortened, and this is natural, for the head of the femur no longer rests on a bone as in dislocation inward, but along the side of a bone which naturally inclines to the side, and it is lodged in flesh of a pulpy and yielding nature, and on that account it appears more shortened Inwardly, the thigh about the perineum appears more hollow and flabby, but externally the buttock is more rounded, from the head of the thigh having slipped outward, but

the nates appear to be raised up, owing to the flesh there having yielded to the head of the thigh-bone, but the extremity of the thigh-bone, at the knee, appears to be turned inward, and the leg and foot in like manner, neither does it admit of flexion like the sound limb. These, then, are the symptoms of dislocation outward.

55 When such a dislocation is not reduced in adults, the whole limb appears to be shortened, and in walking they cannot reach the ground with the heel, but they walk with the ball of the foot on the ground, and the points of their toes incline a little inward. But the injured limb, in this case, can support the body much better than in dislocation inward, both because the head of the femur and the neck of its articular extremity, being naturally oblique, have formed a bed under a considerable portion of the hip, and because the extremity of the foot is not forcibly turned outward, but is nearly in a line with the body, and is even inclined more inwardly. When, then, the articular extremity of the femur has worn out a socket for itself in the flesh where it was lodged, and the flesh is lubricated, it ceases to be painful in the course of time, and when it becomes free from pain, they can walk without a staff, if so inclined, and they can support the body on the injured limb. From usage then, in such cases, the fleshy parts are less enervated than in those which have been mentioned a little before, still, however, they lose their strength more or less, but in general there is more enervation when the dislocation is inward than when it is outward. Some of them, then, cannot wear their shoes, owing to the unbending state of their leg, and some of them can. But when this dislocation takes place *in utero*, and when the dislocation having occurred at any time before manhood, from violence, has not been replaced, or when from disease the articular extremity has started from its socket, and is displaced (for many such cases occur, and from some of them, if the femur become necrosed, obstinate suppurations requiring the use of tents are formed, and in certain of them the bone is laid bare), whether the bone become necrosed or not, the bone of the thigh is much shortened, and does not usually grow like the sound one, the bones, too, of the leg, become shorter than those

of the other, but in a small degree, for the same reasons that were formerly stated, such persons can walk, some of them in the same fashion as adults having an unreduced dislocation, and some of them walk with the whole foot on the ground, but limp in walking, being obliged to do so be the shortness of the limb. Such is the result, even though they be carefully and properly trained in the attitudes before they have strength for walking, and in like manner also, after they have acquired the necessary strength, but those persons require the most care who were very young when they met with the accident, for, if neglected while children, the limb becomes entirely useless and atrophied. The fleshy parts of the entire limb are more wasted than those of the sound limb, but this is much less apt to happen in their case than in dislocation inward, owing to usage and exercise, as they are speedily able to make use of the limb, as was stated a little before with regard to the weasel-armed (*galiancones*)

56 There are persons who, from birth or from disease, have dislocations outward of both the thighs, in them, then, the bones are affected in like manner, but the fleshy parts in their case lose their strength less, the legs, too, are plump and fleshy, except that there is some little deficiency at the inside, and they are plump because they have the equal use of both their legs, for in walking they totter equally to this side and that. Their nates appear very prominent, from the displacement of the bones of the joint. But if in their case the bones do not sphacelate (*become carious*?) and if they do not become bent above the hip-joint, if nothing of this kind happen to them, they become otherwise sufficiently healthy, but the growth of all the rest of the body, with the exception of the head, is arrested.

57 In dislocations of the head of the femur backward, which rarely occur, the patient cannot extend the leg, either at the dislocated joint, or at the ham, to any extent, and of all the dislocations, this is the variety in which the patients have the least power of making extension at the groin and the ham. But, moreover, this also should be known (for it is a valuable piece of knowledge, and of much importance, and yet most people are ignorant of it), that persons in health cannot extend the joint

at the ham, if they do not extend the joint at the groin at the same time, unless they raise the foot very high, for in this way they could do it, neither also could they bend the joint at the ham, but with much greater difficulty, if they do not bend the joint at the groin at the same time. There are many other things in the body which have similar connections, both with regard to the contractions of nerves (*ligaments*²), and the positions of muscles, and many of them more worthy of being known than is generally supposed, and with regard to the nature of the intestine and that of the whole internal cavity, and with regard to the displacements and contractions of the uterus, but all these things will be treated of elsewhere, in a work akin to the present one. But with regard to the matter on hand, they cannot make extension, as has been already stated, and the limb appears shortened, for two reasons—first, because it cannot be extended, and also because the bone has slipped into the flesh of the nates, for the head and neck of the femur, in this dislocation, are carried downward from their natural situation, to the outside of the nates. But yet they can bend the limb, unless prevented by pain, and the leg and foot appear pretty straight, and not much inclined toward either side, but at the groin the flesh, when felt, appears looser, from the bone of the joint having slipped to the other side, but at the nates the head of the femur may be felt to be more prominent than natural. Such are the symptoms accompanying dislocation of the thigh backward.

58 When this dislocation occurs in an adult, and is not reduced, he can walk, indeed, after a time, and when the pain has abated, and when he has been accustomed to rotate the articular bone in the flesh, he finds it necessary, however, to make strong flexion at the groin in walking, for two reasons, both because the limb, for the causes already stated, becomes much shorter, and he is far from touching the ground with his heel, and he can barely reach it with the ball of his foot, and not even thus, unless he bend himself at the groins, and also bend with the other leg at the ham. And in this case, he is under the necessity of supporting the upper part of the thigh with his hand at each step: this also contributes, in a certain degree, to make him bend the body

at the groins, for, during the shifting of the feet in walking, the body cannot be supported on the unsound limb, unless it be pressed to the ground by the hand,—the end of the femur not being placed properly under the body, but having slipped backward to the nates, and if he should try to rest the weight of his body for a little, upon the foot, without any other support, he would fall backward, for there would be a great inclination in this direction, from the hips having protruded backward far beyond the line of the foot, and the spine inclining toward the hips. Such persons can walk, indeed, without a staff, if so accustomed, for because the sole of the foot is in its old line, and is not inclined outward, they do not require anything to balance them. Such, however, as, instead of grasping the thigh, prefer resting their weight upon a staff introduced into the armpit of the affected side, these, if they use a longer staff, will walk, indeed, more erect, but will not be able to reach the ground with the foot, or if they wish to rest upon the foot, they must take a shorter staff, and will require to bend the body at the groins. The wasting of the fleshy parts is analogous to what happens in the cases formerly described, for the wasting is greatest in those cases in which the patients keep the limb up, and do not exercise it, whilst those who practice walking, have the least atrophy. The sound leg, however, is not benefited, but is rather rendered more deformed, if the injured limb be applied to the ground, for it is forced to co-operate with the other, being protruded at the hip, and bent at the ham. But if the patient does not use the injured limb by applying it to the ground, but carries it up, and rests upon a staff, the sound leg thereby gains strength, for it is employed in its natural position, and further, the exercise gives it strength. But it may be said, these things are foreign to medicine, for what is the use of enlarging upon cases which are already past remedy? This is far from being the case, for it belongs to the knowledge of medicine to be acquainted also with these, and they cannot possibly be separated from one another, for to such as are curable, means are to be used to prevent them from becoming incurable, studying how they may best be prevented from getting into an incurable state. And incurable cases should be known, that they

may not be aggravated by useless applications, and splendid and creditable prognostics are made by knowing where, how, and when every case will terminate, and whether it will be converted into a curable or an incurable disease. When then, from birth, or during one's youth, this dislocation backward occurs, and is not reduced, whether it be connected with violence or disease (for many such dislocations occur in diseases, but the nature of the diseases in which dislocations take place, will be described afterward); if, then, the dislocated limb be not reduced, the bone of the thigh becomes shortened, the whole limb is impaired, is arrested in its growth, and loses its flesh from want of use; the articulation at the ham is also impaired, for the nerves (*ligaments*²) become stretched, from the causes formerly stated, wherefore those who have this dislocation, cannot make extension at the knee-joint. In a word, all parts of the body which were made for active use, if moderately used and exercised at the labor to which they are habituated, become healthy, increase in bulk, and bear their age well, but when not used, and when left without exercise, they become diseased, their growth is arrested, and they soon become old. Among these parts the joints and nerves (*ligaments*²), if not used, are not the least liable to be so affected, they are impaired, then, for the reasons we have stated, more in this variety of dislocation than in the others, for the whole limb is wasted, both in its bones and in its fleshy parts. Such persons, then, when they attain their full growth, keep the limb raised and flexed, rest the weight of the body on the other leg, and support themselves with a staff, some with one, and others with two.

59 In dislocations of the head of the thigh-bone forward (they are of rare occurrence), the patients cannot extend the leg completely, but least of all can they bend it at the groin, they are pained, also, if forced to bend the limb at the ham. The length of the leg, if compared at the heel, is the same as that of the other, but the extremity of the foot inclines less to project forward. But the whole limb has its natural direction, and inclines neither to this side nor to that. These cases are particularly attended with severe pain, and they are more apt to be accompanied with retention of urine at first than any of the other

dislocations, for the head of the thigh-bone is lodged very near to important nerves And the region of the groin appears swelled out and stretched, while that of the nates is more wrinkled and flabby The symptoms now stated are those which attend this dislocation of the thigh-bone

60 When persons have attained their full growth before meeting with this dislocation, and when it has not been reduced, upon the subsidence of the pain, and when the bone of the joint has been accustomed to be rotated in the place where it is lodged, these persons can walk almost erect without a staff, and with the injured leg almost quite straight, as it does not admit of easy flexion at the groin and the ham, owing, then, to this want of flexion at the groin, they keep the limb more straight in walking than they do the sound one And sometimes they drag the foot along the ground, as not being able to bend the upper part of the limb, and they walk with the whole foot on the ground, for in walking they rest no less on the heel than on the fore part of the foot, and if they could take great steps, they would rest entirely on the heel in walking, for persons whose limbs are sound, the greater the steps they take in walking, rest so much the more on the heel, while they are putting down the one foot and raising the opposite In this form of dislocation, persons rest their weight more on the heel than on the anterior part of the foot, for the fore part of the foot cannot be bent forward equally well when the rest of the limb is extended as when it is in a state of flexion, neither, again, can the foot be arched to the same degree when the limb is bent as when it is extended The natural state of matters is such as has been now described, and in an unreduced dislocation, persons walk in the manner described, for the reasons which have been stated The limb, moreover, is less fleshy than the other, at the nates, the calf of the leg, and the whole of its posterior part When this dislocation occurs in infancy, and is not reduced, or when it is congenital, in these cases the bone of the thigh is more atrophied than those of the leg and foot, but the atrophy of the thigh-bone is least of all in this form of dislocation The fleshy parts, however, are everywhere attenuated, more especially behind, as has been stated above If properly trained,

such persons, when they grow up, can use the limb, which is only a little shorter than the other, and yet they support themselves on a staff at the affected side. For, not being able to use properly the ball of the foot without the heel, nor to put it down as some can in the other varieties of dislocation (the cause of which has been just now stated), on this account they require a staff. But those who are neglected, and are not in the practice of putting their foot to the ground, but keep the limb up, have the bones more atrophied than those who use the limb, and, at the articulations, the limb is more maimed in the direct line than in the other forms of dislocation.

61 In a word, luxations and subluxations take place in different degrees, being sometimes greater and sometimes less, and those cases in which the bone has slipped or been displaced to a much greater extent, are in general more difficult to rectify than otherwise, and if not reduced, such cases have greater and more striking impairment and lesion of the bones, fleshy parts, and attitudes, but when the bone has slipped, or been displaced to a less extent, it is easier to reduce such cases than the other, and if the attempts at reduction have failed, or have been neglected, the impairment in such cases is less, and proves less injurious than in the cases just mentioned. The other joints present great differences as to the extent of the displacements which they are subject to. But the heads of the femur and humerus are very similar to one another as to their dislocations. For the heads of the bones are rounded and smooth, and the sockets which receive the heads are also circular, and adapted to the heads, they do not admit then of being dislocated in any intermediate degree, but, from their rounded shape, the bones slip either outward or inward. In the case we are now treating of, then, there is either a complete dislocation or none at all, and yet these bones admit of being displaced to a greater or less extent, and the thigh is more subject to these differences than the arm.

62 Wherefore, then, some of these congenital displacements, if to a small extent, may be reduced to their natural condition, and especially those at the ankle-joint. Most cases of congenital club-foot are remediable, unless the declination be very great,

or when the affection occurs at an advanced period of youth The best plan, then, is to treat such cases at as early a period as possible, before the deficiency of the bones of the foot is very great, and before there is any great wasting of the flesh of the leg There is more than one variety of club-foot, the most of them being not complete dislocations, but impairments connected with the habitual maintenance of the limb in a certain position In conducting the treatment, attention must be paid to the following points to push back and rectify the bone of the leg at the ankle from without inward, and to make counter-pressure on the bone of the heel in an outward direction, so as to bring it into line, in order that the displaced bones may meet at the middle and side of the foot, and the mass of the toes, with the great toe, are to be inclined inward, and retained so, and the parts are to be secured, with cerate containing a full proportion of resin, with compresses, and soft bandages in sufficient quantity, but not applied too tight, and the turns of the bandages should be in the same direction as the rectifying of the foot with the hand, so that the foot may appear to incline a little outward And a sole made of leather not very hard, or of lead, is to be bound on, and it is not to be applied to the skin but when you are about to make the last turns of the bandages And when it is all bandaged, you must attach the end of one of the bandages that are used to the bandages applied to the inferior part of the foot on the line of the little toe, and then this bandage is to be rolled upward in what is considered to be a sufficient degree, to above the calf of the leg, so that it may remain firm when thus arranged In a word, as if moulding a wax model, you must bring to their natural position the parts which were abnormally displaced and contracted together, so rectifying them with your hands, and with the bandaging in like manner, as to bring them into their position, not by force, but gently, and the bandages are to be stitched so as to suit the position in which the limb is to be placed, for different modes of the deformity require different positions And a small shoe made of lead is to be bound on externally to the bandaging, having the same shape as the Chian slippers had But there is no necessity for it if the parts be properly adjusted

with the hands, properly secured with the bandages, and properly disposed of afterward. This, then, is the mode of cure, and it neither requires cutting, burning, nor any other complex means, for such cases yield sooner to treatment than one would believe. However, they are to be fairly mastered only by time, and not until the body has grown up in the natural shape, when recourse is had to a shoe, the most suitable are the buskins, which derive their name from being used in traveling through mud, for this sort of shoe does not yield to the foot, but the foot yields to it. A shoe shaped like the Cretan is also suitable.

63 In cases of complete dislocation at the ankle-joint, complicated with an external wound, whether the displacement be inward or outward, you are not to reduce the parts, but let any other physician reduce them if he choose. For this you should know for certain, that the patient will die if the parts are allowed to remain reduced, and that he will not survive more than a few days, for few of them pass the seventh day, being cut off by convulsions, and sometimes the leg and foot are seized with gangrene. It should be well known that such will be the results, and it does not appear to me that hellebore will do any good, though administered the same day, and the draught repeated, and yet it is the most likely means, if any such there be, but I am of opinion that not even it will be of service. But if not reduced, nor any attempts at first made to reduce them, most of such cases recover. The leg and foot are to be arranged as the patient wishes, only they must not be put in a dependent position, nor moved about, and they are to be treated with pitched cerate, a few compresses dipped in wine, and not very cold, for cold in such cases induces convulsions, the leaves also of beet, or of colt's foot, of any such, when boiled in dark-colored austere wine, form a suitable application to the wound and the surrounding parts, and the wound may further be anointed with cerate in a tepid state. But if it be the winter season, the part is to be covered with unsoured wool, which is to be sprinkled from above with tepid wine and oil, but on no account is either bandage or compress to be applied, for this should be known most especially, that whatever compresses, or is heavy, does mischief in such cases. And certain of

the dressings used to recent wounds are suitable in such cases, and wool may be laid upon the sore, and sprinkled with wine, and allowed to remain for a considerable time, but those dressings for recent wounds which only last for a few days, and into which resin enters as an ingredient, do not agree with them; for the cleansing of the sores is a slow process, and the sore has a copious discharge for a long time. Certain of these cases it may be advantageous to bandage. It ought also to be well understood, that the patient must necessarily be much maimed and deformed, for the foot is retracted outward, and the bones which have been displaced outward protrude. These bones, in fact, not being generally laid bare, unless to a small extent, neither do they exfoliate, but they heal by thin and feeble cicatrices, provided the patient keeps quiet for a length of time, but otherwise there is danger that a small ulcer may remain incurable. And yet in the case we are treating of, those who are thus treated are saved, whereas, when the parts are reduced and allowed to remain in place, the patients die.

64 The same rule applies to dislocations at the wrist, attended with a wound and projection of the bone, whether the bones of the arm be displaced inward or outward. For this should be well understood, that the patient will die in the course of a few days, by the same mode of death as formerly described, if the bone be reduced, and allowed to remain so. But in those cases in which they are not reduced, nor any attempt made to reduce them, the patients, for the most part, recover, and the same mode of treatment as has been described will be applicable, but the deformity and impediment of the limb must necessarily be great, and the fingers of the hand will be weak and useless, for if the bones have slipped inward, they cannot bend the fingers, or if outward, they cannot extend them.

65 When the *os tibiæ*, having made a wound at the knee, has protruded through the skin, whether the dislocation be outward or inward, in such a case, if the bone be reduced, death will be even more speedy than in the other cases, although speedy also in them. But the only hope of recovery is if you treat them without reduction. These cases are more dangerous than the others,

as being so much higher up, as being so much stronger joints, and displaced from bones which are so much stronger But if the os femoris form a wound at the knee, and slip through it, provided it be reduced and left so, it will occasion a still more violent and speedy death than in the cases formerly described, but if not reduced, it will be much more dangerous than those cases mentioned before, and yet this is the only hope of recovery

66 The same rule applies to the elbow-joint, and with regard to the bones of the fore-arm and arm For when these bones protrude through a wound which they have made in the skin, all cases in which they are reduced prove fatal, but if not reduced, there is a chance of recovery, but to those that survive there is certain impediment And if in any instance the bones of the upper articulations (*shoulder-joint?*), should be dislocated, and project through a wound which they have made in the skin, these, if reduced, are followed by more speedy death, and if not reduced, they are more dangerous than the others But the mode of treatment which appears to me most suitable has been already described

67 When the joints of the toes or hands are dislocated, and the bones protrude through a wound which they have made, and when there is no fracture of the bone, but merely displacement of the joint, in these cases, if the reduction be made and allowed to remain, there is some danger of spasms (*tetanus?*) if not properly treated, and yet it may be worth while to reduce them, having warned the patient beforehand that much caution and care will be required The easiest, the most efficient method, and the one most conformable to art, is that by the lever, as formerly described when treating of bones which have been fractured and protruded, then the patient must be as quiet as possible, lie in a recumbent position, and observe a restricted regimen And it will be better also that he should get some gentle emetics The sore is to be treated with dressings for fresh wounds, which permit of affusions, or with the leaves of camomile, or with the applications for fractured bones of the head, but nothing very cold must be applied The first (*most distant?*) joints are least dangerous, but those still higher, are more so

Reduction should be made the same day, or the next, but by no means on the third or fourth, for it is on the fourth day that exacerbations especially attack. In those cases, then, where immediate reduction cannot be accomplished, we must wait until after the aforesaid days, for whatever you reduce within ten days, may be expected to induce spasm. But if the spasm supervene on its being reduced, the joint should be quickly displaced, and bathed frequently with warm water, and the whole body should be kept in a warm, soft, and easy condition, and more especially about the joints, for the whole body should rather be in a bent than in an extended state. Moreover, it is to be expected, that the articular extremities of the bones of the fingers will exfoliate, for this generally happens, if even the least degree of inflammation take place, so that if it were not that the physician would be exposed to censure, owing to the ignorance of the common people, no reduction should be made at all. The reduction of the bones of joints which have protruded through the skin, is attended with the dangers which have been described.

68 When the articular bones of the fingers are fairly chopped off, these cases are mostly unattended with danger, unless deliquium come on in consequence of the injury, and ordinary treatment will be sufficient to such sores. But when resection is made, not at the articulations, but at some other point in the bones, these cases also are free from danger, and are still more easily cured than the others, and the fractured bones of the fingers which protrude otherwise than at the joint admit of reduction without danger. Complete resections of bones at the joints, whether the foot, the hand, the leg, the ankle, the forearm, the wrist, for the most part, are not unattended with danger, unless one be cut off at once by deliquium animi, or if continual fever supervene on the fourth day.

69 With regard to the sphacelus of fleshy parts, it takes place in wounds where there are large blood-vessels, which have been strongly compressed, and in fractures of bones which have been bound too tight, and in other cases of immoderate constriction, when the parts which have been strangulated generally drop off, and the most of such patients recover, even when a portion of the

thigh comes away, or of the arm, both bones and flesh, but less so in this case, and when the fore-arm and leg drop off, the patients readily recover. In cases then, of fracture of the bones, when strangulation and blackening of the parts take place at first, the separation of the dead and living parts quickly occurs, and the parts speedily drop off, as the bones have already given way, but when the blackening (*mortification*) takes place while the bones are entire, the fleshy parts, in this case, also quickly die, but the bones are slow in separating at the boundary of the blackening, and where the bones are laid bare. Those parts of the body which are below the boundaries of the blackening are to be removed at the joint, as soon as they are fairly dead and have lost their sensibility, care being taken not to wound any living part, for if the part which is cut off give pain, and if it should prove not to be quite dead, there is great danger lest the patient may swoon away from the pain, and such swoonings often are immediately fatal. I have known the thigh-bones, when denuded in this manner, drop off on the eightieth day, but in the case of this patient, the parts below were separated at the knee on the twentieth day, and, as I thought, too early, for it appeared to me that this should be done more guardedly. In a case which I had of such blackening in the leg, the bones of the leg, as far as they were denuded, separated at its middle on the sixtieth day. But the separation of denuded bones is quicker or slower, according to the mode of treatment, something, too, depends upon whether the compression be stronger or weaker, and whether the nerves, flesh, arteries, and veins are quicker or slower in becoming blackened and in dying, since, when the parts are not strongly compressed, the separation is more superficial, and does not go the length of laying the bones bare, and in some cases it is still more superficial, so as not even to expose the nerves. For the reasons now stated, it is impossible to define accurately the time at which each of these cases will terminate. The treatment of such cases, however, is to be readily undertaken, for they are more formidable to look at than to treat, and a mild treatment is sufficient in all such cases, for they come to a crisis of themselves, only the diet must be attended to, so that it may be as little

calculated to create fever as possible, and the body is to be placed in the proper positions these are, neither raised very high up, nor inclined much downward, but rather upward, until the separation be completed, for at that time there is most danger of hemorrhage, on this account, wounds should not be laid in a declining position, but the contrary But after a while, and when the sores have become clean, the same positions will no longer be appropriate, but a straight position, and one inclining downward, may be proper, and in the course of time, in some of these cases, abscesses form, and require bandages One may also expect that such patients will be attacked with dysentery, for dysentery usually supervenes in cases of mortification and of hemorrhage from wounds, it comes on generally when the blackening and hemorrhage have arrived at a crisis, and is profuse and intense, but does not last many days, neither is it of a fatal nature, for such patients do not usually lose their appetite, nor is it proper to put them on a restricted diet

70 Dislocation inward at the hip-joint is to be reduced in the following manner. (it is a good, proper, and natural mode of reduction, and has something of display in it, if any one takes delight in such ostentatious modes of procedure) The patient is to be suspended by the feet from a cross-beam with a strong, soft, and broad cord, the feet are to be about four inches or less from one another, and a broad and soft leather collar connected with the cross-beam is to be put on above the knees, and the affected leg should be so extended as to be two inches longer than the other, the head should be about two cubits from the ground, or a little more or less, and the arms should be stretched along the sides, and bound with something soft, all these preparations should be made while he is lying on his back, so that he may be suspended for as short a time as possible But when the patient is suspended, a person properly instructed and not weak, having introduced his arm between his thighs, is to place his fore-arm between the perineum and the dislocated head of the os femoris, and then, having joined the other hand to the one thus passed through the thighs, he is to stand by the side of the suspended patient, and suddenly suspend and swing himself in the air as

perpendicularly as possible This method comprises all the conditions which are natural, for the body being suspended by its weight, produces extension, and the person suspended from him, along with the extension, forces the head of the thigh-bone to rise up above the acetabulum, and at the same time he uses the bone of the fore-arm as a lever, and forces the os femoris to slip into its old seat The cords should be properly prepared, and care should be taken that the person suspended along with the patient have a sufficiently strong hold

71 Wherefore, as formerly stated, men's constitutions differ much from one another as to the facility or difficulty with which dislocations are reduced, and the cause of this was also stated formerly in treating of the shoulder In some the thigh is reduced with no preparation, with slight extension, directed by the hands, and with slight movement, and in some the reduction is effected by bending the limb at the joint, and making rotation But much more frequently it does not yield to any ordinary apparatus, and therefore one should be acquainted with the most powerful means which can be applied in each case, and use whatever may be judged most proper under all circumstances The modes of extension have been described in the former parts of the work, so that one may make use of whatever may happen to be at hand For, extension and counter-extension are to be made in the direction of the limb and the body, and if this be properly effected, the head of the thigh-bone will be raised above its ancient seat, and if thus raised, it will not be easy to prevent it from settling in its place, so that any ordinary impulse with the lever and adjustment will be quite sufficient, but some apply insufficient extension, and hence the reduction gives much trouble The bands then should be fastened, not only at the foot, but also above the knee, so that the force of the extension may not be expended on the knee-joint more than upon the hip-joint The extension in the direction of the foot is to be thus contrived But the counter-extension is not only to be managed by means of something carried round the chest and armpits, but also by a long, double, strong, and supple thong applied to the perineum, and carried behind along the spine, and in front along the collar-bone

and fixed to the point from which counter-extension is made, and then force is to be so applied, by means of this extension and counter-extension, that the thong at the perineum may not pass over the head of the thigh-bone, but between it and the perineum, and during the extension one should strike the head of the femur with the fist, so as to drive it outward. And when the patient is raised up by the stretching, you should pass a hand through (*between the legs?*) and grasp it with the other hand, so as at the same time to make extension, and force the dislocated limb outward, while some other person sitting by the knee quietly directs it inward.

72 It has been formerly stated by us that it will be of importance for any person who practices medicine in a populous city to get prepared a quadrangular board, about six cubits or a little more in length, and about two cubits in breadth, a fathom will be sufficient thickness for it, and then along it from the one end to the other, an excavation must be made, so that the working of the levers may not be higher than is proper, then at both sides we are to raise short, strong, and strongly-fixed posts, having axles, and in the middle of the bench five or six long grooves are to be scooped out about four inches distant from one another, three inches will be a sufficient breadth for them, and the depth in like manner, and although the number of grooves I have mentioned will be sufficient, there is nothing to prevent their being made all over the bench. And the bench should have in its middle a pretty deep hole, of a square shape, and of about three inches in size, and into this hole, when judged necessary, is to be adjusted a corresponding piece of wood, rounded above, which, at the proper time, is to be adjusted between the perineum and the head of the thigh-bone. This upright piece of wood prevents the body from yielding to the force dragging downward by the feet, for sometimes this piece of wood serves the purpose of counter-extension upward, and sometimes, too, when extension and counter-extension are made, this piece of wood, if susceptible of some motion to this side or that, will serve the purpose of a lever for pushing the head of the thigh-bone outward. It is on this account that several grooves are scooped out on the bench,

so that this piece of wood, being erected at the one which answers, may act as a lever, either on the sides of the articular heads of bones, or may make pressure direct on the heads along with the extension, according as it may suit to push inward or outward with the lever, and the lever may be either of a round or broad form, as may be judged proper, for sometimes the one form and sometimes the other suits with the articulation. This mode of applying the lever along with extension is applicable in the reduction of all dislocations of the thigh. In the case now on hand, a round lever is proper, but in dislocations outward a flat lever will be the suitable one. By means of such machines and of such powers, it appears to me that we need never fail in reducing any dislocation at a joint.

73 And one might find out other modes of reduction for this joint. If the large bench were to have raised on it two posts about a foot (*in diameter*²), and of a suitable height, on each side near its middle, and if a transverse piece of wood like the step of a ladder, were inserted in the posts, then if the sound leg were carried through between the posts, and the injured limb were brought over the transverse piece of wood, which should be exactly adapted in height to the joint which is dislocated, (and it is an easy matter so to adjust it, for the step of the ladder should be made a little higher than required, and a convenient robe, folded several times, is to be laid below the patient's body), then a piece of wood, of suitable breadth and length, is to be laid below the limb, and it should reach from the ankle to beyond the head of the thigh-bone, and should be bound moderately tight to the limb. Then the limb being extended, either by means of the pestle-like piece of wood (formerly described), or by any of the other methods of extension, the limb which is carried over the step with the piece of wood attached to it, is to be forced downward, while somebody grasps the patient above the hip-joint. In this manner the extension will carry the head of the thigh-bone above the acetabulum, while the lever power that is exercised will push the head of the thigh-bone into its natural seat. All the above-mentioned powers are strong, and more than sufficient to rectify the accident, if properly and skill-

fully applied For, as formerly stated, in most cases reduction may be effected by much weaker extension, and an inferior apparatus

74 If the head of the bone slip outward, extension and counter-extension must be made as described, or in a similar manner But along with the extension a broad lever is to be used to force the bone from without inward, the lever being placed at the nates or a little farther up, and some person is to steady the patient's body, so that it may not yield, either by grasping him at the buttock with his hands, or this may be effected by means of another similar lever, adjusted to one of the grooves, while the patient has something laid below him, and he is secured, and the dislocated thigh is to be turned gently from within outward at the knee Suspension will not answer in this form of dislocation, for, in this instance, the arm of the person suspended from him, would push the head of the thigh-bone from the acetabulum But one might use the piece of wood placed below him as a lever, in such a manner as might suit with this mode of dislocation, it must work from without But what use is there for more words? For if the extension be well and properly done, and if the lever be properly used, what dislocation of the joint could occur, that might not be thus reduced?²

75 In dislocation of the thigh, backward, extension and counter-extension should be made as has been described, and having laid on the bench a cloth which has been folded several times, so that the patient may lie soft, he is to be laid on his face, and extension thus made, and, along with the extension, pressure is to be made with a board, as in the case of humpback, the board being placed on the region of the nates, and rather below than above the hip-joint, and the hole made in the wall for the board should not be direct over, but should be inclined a little downward, toward the feet This mode of reduction is particularly appropriate to this variety of dislocation, and at the same time is very strong But perhaps, instead of the board, it might be sufficient to have a person sitting (*on the seat of luxation?*), or pressing with his hands, or with his foot, and suddenly raising himself up, along with the extension None of the other afore-

mentioned modes of reduction are natural in this form of dislocation

76 In dislocation forward, the same mode of extension should be made, but a person who has very strong hands, and is well trained, should place the palm of the one hand on the groin, and taking hold of this hand with the other, is at the same time to push the dislocated part downward, and at the same time to the fore part of the knee This method of reduction is most especially conformable to this mode of dislocation And the mode of suspension is also not far removed from being natural, but the person suspended should be well trained, so that his arm may not act as a lever upon the joint, but that the force of the suspension may act about the middle of the perineum, and at the os sacrum

77 Reduction by the bladder is also celebrated in dislocations at this joint, and I have seen certain persons who, from ignorance, attempted to reduce both dislocations outward and backward therewith, not knowing that they were rather displacing than replacing the parts, it is clear, however, that he who first invented this method intended it for dislocation inward It is proper, then, to know how the bladder should be used, if it is to be used, and it should be understood that many other methods are more powerful than it The bladder should be placed between the thighs uninflated, so that it may be carried as far up the perineum as possible, and the thighs beginning at the patella are to be bound together with a swathe, as far up as the middle of the thigh, and then a brass pipe is to be introduced into one of the loose feet of the bladder, and air forced into it, the patient is to lie on his side with the injured limb uppermost This, then, is the preparation, some, however, do the thing worse than as I have described, for they do not bind the thighs together to any extent, but only at the knees, neither do they make extension, whereas extension should be made, and yet some people by having the good fortune to meet with a favorable case, have succeeded in making reduction But it is not a convenient method of applying force, for the bladder, when inflated, does not present its most prominent part to the articular extremity of the femur, which is the place

that ought to be more especially pressed outward, but its middle, which probably corresponds with the middle of the thigh, or still lower down, for the thighs are naturally curved, being fleshy, and in contact above, and becoming smaller downward, so that the natural configuration of the parts forces the bladder from the most proper place. And if a small bladder be introduced, its power will be small, and unable to overcome the resistance of the articular bone. But if the bladder must be used, the thighs are to be bound together to a considerable extent, and the bladder is to be inflated along with the extension of the body, and in this method of reduction both legs are to be bound together at their extremity.

78 The prime object of the physician in the whole art of medicine should be to cure that which is diseased, and if this can be accomplished in various ways, the least troublesome should be selected, for this is more becoming a good man, and one well skilled in the art, who does not covet popular coin of base alloy. With regard to the subject now on hand, the following are domestic means of making extension of the body, so that it is easy to choose from among the things at hand.—In the first place, when soft and supple thongs are not at hand for ligatures, either iron chains, or cords, or cables of ships, are to be wrapped round with scarfs or pieces of woollen rags, especially at the parts of them which are to be applied, and in this state they are to be used as bands. In the second place, the patient is to be comfortably laid on the strongest and largest couch that is at hand, and the feet of the couch, either those at the (*patient's*?) head, or those at the feet, are to be fastened to the threshold, either within or without, as is most suitable, and a square piece of wood is to be laid across, and extending from the one foot to the other, and if this piece of wood be slender, it should be bound to the feet of the couch, but, if it be thick, there will be no necessity for this, then the heads of the ligatures, both of those at the head and those at the feet, are to be fastened to a pestle, or some such piece of wood, at either end, the ligatures should run along the line of the body, or be a little elevated above it, and it should be stretched proportionally to the pestles, so that, standing erect, the one may be

fastened to the threshold, and the other to the transverse piece of wood. Extension is then to be made by bending back the ends of the pestles. A ladder, having strong steps, if laid below the bed, will serve the purpose of the threshold and the piece of wood laid along (*the foot of the couch?*), as the pestles can be fastened to the steps at either end, and when drawn back they thus make extension of the ligatures. Dislocation, inward or forward, may be reduced in the following manner: a ladder is to be fastened in the ground, and the man is to be seated upon it, and then the sound leg is to be gently stretched along and bound to it, wherever it is found convenient, and water is to be poured into an earthen vessel, or stones put into a hamper and slung from the injured leg, so as to effect the reduction. Another mode of reduction: a cross-beam is to be fastened between two pillars of moderate height, and at one part of the cross-beam there should be a protuberance proportionate to the size of the nates, and having bound a coverlet round the patient's breast, he is to be seated on the protuberant part of the cross-beam, and afterward the breast is to be fastened to the pillar by some broad ligature, then some one is to hold the sound leg so that he may not fall off, and from the injured limb is to be suspended some convenient weight, as formerly described.

79 It should be particularly known that the union of all bones is, for the most part, by a head and socket (*cotylé*), in some of these the place (*socket?*) is cotyloid and oblong, and in some the socket is glenoid (*shallow?*). In all dislocations reduction is to be effected, if possible, immediately, while still warm, but otherwise, as quickly as it can be done, for reduction will be a much easier and quicker process to the operator, and a much less painful one to the patient, if effected before swelling comes on. But all the joints when about to be reduced should be first softened, and gently moved about, for, thus they are more easily reduced. And, in all cases of reduction at joints, the patient must be put on a spare diet, but more especially in the case of the greatest joints, and those most difficult to reduce, and less so in those which are very small and easily reduced.

80 If any joint of the fingers is dislocated, whether the first,

second, or the third, the same method of reduction is to be applied, but the largest joints are the most difficult to reduce. There are four modes of displacement—either upward, downward, or to either side, most commonly upward, and most rarely laterally, and in consequence of violent motion. On both sides of its articular cavity there is a sort of raised border. When the dislocation is upward or downward, owing to the articular cavity having smoother edges there than at the sides, if the joint of it be dislocated, it is more easily reduced. This is the mode of reduction.—The end of the finger is to be wrapped round with a fillet, or something such, that, when you lay hold of it and make extension, it will not slip, and when this is done, some person is to grasp the arm at the wrist, and another is to take hold of the finger which is wrapped in the fillet, and then each is to make considerable extension toward himself, and at the same time the projecting bone is to be pushed into its place. But, if the dislocation be lateral, the same mode of reduction is to be used, but when you think that the extremity of the bone has cleared the rim, at the same time that extension is made, the bone is to be pushed direct into its place, while another person on the other side of the finger is to take care and make counter-pressure, so that it may not again slip out there. The twisted nooses formed from palm-shoots are convenient for effecting reduction, if you will make extension and counter-extension by holding the twisted string in the one hand and the wrist in the other. When reduced, you must bind the part as quickly as possible with bandages, these are to be very slender and waxed with cerate, neither very soft nor very hard, but of middle consistence, for that which is hard drops off from the finger, while that which is soft and liquid is melted and lost by the increased heat of the finger. The bandage is to be loosed on the third or fourth day, but on the whole, if inflamed, it is to be the more frequently loosed, and if otherwise, more rarely, this I say respecting all the joints. The articulation of a finger is restored in fourteen days. The treatment of the fingers and of the toes is the same.

81 After all reductions of joints the patient should be confined to a restricted diet and abstinence until the seventh day,

and if there be inflammation, the bandages are to be the more frequently loosed, but otherwise, less frequently, and the pained joint is to be kept constantly in a state of rest, and is to be laid in the most convenient position possible

82 Accidents at the knee are more mild than at the elbow, from its being more compact, regular, and elegant in its construction, and, therefore, it is more readily dislocated and reduced. It is most frequently dislocated inward, but also outward and backward. The modes of reduction are these by flexion at the knee, or by sudden calcitration, or having rolled a swathe into a ball, and fixed it in the ham, the patient's body is to be suddenly dropped on its bended knees. Dislocation backward, also, as in the case of the elbow, may be reduced by moderate extension, and to either side, either by flexion or calcitration, but also by moderate extension. The adjustment is the same in all cases. In dislocations backward which are not reduced, the patient cannot bend the joint, but neither can he, to any great extent, in the other varieties, the thigh and leg are wasted in front, but if inward the patients become bow-legged, and the external parts are wasted, but if outward they become more bandy-legged, but the impediment is less, for the body is supported on the larger of the bones, and the inner parts are wasted. When these accidents happen at birth or during adolescence, they follow the rule formerly stated.

83 Dislocations at the ankle-joints require strong extension, either with the hands or some such means, and adjustment, which at the same time effects both purposes, as is common in all cases.

84 Injuries of the foot are to be remedied like those of the hand.

85 The bones connected with the leg, and which are dislocated, either at birth or during adolescence, follow the same course as those in the hand.

86 When persons jumping from a height pitch on the heel, so as to occasion separation (*diastasis*) of the bones, ecchymosis of the veins, and contusion of the nerves, when these symptoms are very violent there is danger of sphacelus, and that the case may give trouble during life, for the bones are so constructed as

to slip from one another, and the nerves communicate together And, indeed, in cases of fracture, either from an injury in the leg or thigh, or in paralysis of the nerves (*tendons?*) connected with these parts, or from neglect during confinement to bed, when the heel gets blackened the most serious consequences result therefrom Sometimes, in addition to the sphacelus, there come on acute fevers accompanied with hiccup, aberration of intellect, and speedy death, with lividities of the large blood-vessels With regard to the symptoms attending exacerbations, if the ecchymosed and blackened parts and those around be somewhat hard and red, and if along with the hardness there be lividity, mortification is to be apprehended, but if the parts be slightly livid, or even very livid, and the swelling diffused, or if greenish and soft, these appearances, in such cases, are all favorable The treatment, if no fever be present, consists in the administration of hellebore, but otherwise it is not to be given, but *oxyglyky* (*decoction of honeycombs and vinegar*) is to be given for drink, if required Bandaging as in the other articulations above all, more especially in contusions, the bandages should be numerous and softer than usual, but the compression should be less, most turns should be made around the heel Position, like the bandaging, should be so regulated as not to determine to the heel Splints are not to be used

87 When the foot is dislocated, either alone or along with its epiphysis, the displacement is, for the most part, to the inside If not reduced, in the course of time, the hip, the thigh, and the side of the leg opposite the dislocation, become atrophied Reduction is the same as in the wrist, but the extension requires to be very powerful Treatment, agreeably to the general rule for joints Exacerbations do occur, but less frequently than in dislocations at the wrist, provided the parts get rest While they remain at rest the diet should be restricted Those which occur at birth, or during adolescence, follow the rule formerly stated



Mochlicus

WITH regard to the construction of bones,¹ the bones and joints of the fingers are simple, the bones of the hand and foot are numerous, and articulated in various ways, the uppermost are the largest, the heel consists of one bone which is seen to project outward, and the back tendons are attached to it. The leg consists of two bones, united together above and below, but slightly separated in the middle, the external bone (*fibula*), where it comes into proximity with the little toe, is but slightly smaller than the other, more so where they are separated, and at the knee, the outer hamstring arises from it,² these bones have a common epiphysis below, with which the foot is moved, and another epiphysis above,³ in which is moved the articular extremity of the femur, which is simple and light in proportion to its length, in the form of a condyle, and having the patella (connected with it⁴), the femur itself bends outward and forward, its head is a round epiphysis which gives origin to ligament inserted in the acetabulum of the hip-joint⁴. This bone is articulated somewhat obliquely, but less so than the

¹ The brief description of the bones given in this paragraph is evidently condensed from a larger work on the subject. A considerable portion of the matter which is found here in an abridged form, is taken from the preceding treatises, On Fractures and On the Articulations, but not the whole of it.

² The tendon of the biceps.

³ It will be here perceived that by epiphysis is merely meant a close union of the two bones by means of a ligament. The term in this paragraph is not always used in this sense. Strictly speaking, its signification would appear to be a protuberance of a bone. It is applied to the malleoli, to the head of the tibia, to the head and neck of the femur, to the spinous processes of the vertebræ, to the upper and lower extremities of the humerus and to the lower extremity of the radius.

⁴ Allusion is evidently made to the ligamentum teres.

humerus The ischium is united to the great vertebra contiguous to the os sacrum by a cartilaginous ligament⁵ The spine, from the os sacrum to the great vertebra, is curved backward, in this quarter are situated the bladder, the organs of generation, and the inclined portion of the rectum, from this to the diaphragm it proceeds in a straight line inclining forward, and the psoæ are situated there, from this point, to the great vertebra above the tops of the shoulders, it rises in a line that is curved backward, and the curvature appears greater than it is in reality, for the posterior processes of the spine are there highest, the articulation of the neck inclines forward The vertebræ on the inside⁶ are regularly placed upon one another, but behind they are connected by a cartilaginous ligament, they are articulated in the form of synarthrosis at the back part of the spinal marrow, behind they have a sharp process having a cartilaginous epiphysis, whence proceeds the roots of nerves running downward, as also muscles extending from the neck to the loins, and filling the space between the ribs and the spine The ribs are connected to all the intervertebral spaces on the inside, from the neck to the lumbar region, by a small ligament, and before to the sternum, their extremities being spongy and soft, their form is the most arched in man of all animals, for in this part, man is, of all animals, the narrowest in porportion to his bulk The ribs are united to each vertebra by a small ligament at the place from which the short and broad lateral processes (*transverse processes*?) arise The sternum is one continuous bone, having lateral pits for the insertion of the ribs, it is of a spongy and cartilaginous structure The clavicles are rounded in front, having some slight movements at the sternum, but more free at the acromion The acromion, in man, arises from the scapulæ differently from most other animals The scapula is cartilaginous toward the spine, and spongy elsewhere, having an irregular figure externally,

⁵ It will be readily perceived that the term ischium is not used here exactly as applied by modern anatomists It is applied in this place to the ilium where it is articulated with the os sacrum By the great vertebra, as stated in the preceding work, is meant the last vertebra of the loins

⁶ Meaning before, that is to say, at their anterior part

its neck and articular cavity cartilaginous, it does not interfere with the movements of the ribs, and is free of all connection with the other bones, except the humerus. The head of the humerus is articulated with its (*glenoid*²) cavity, by means of a small ligament, and it consists of a rounded epiphysis composed of spongy cartilage, the humerus itself is bent outward and forward, and it is articulated with its (*glenoid*²) cavity by its side, and not in a straight line. At the elbow it is broad, and has condyles and cavities, and is of a solid consistence, behind it is a cavity in which the coronoid process (*olecranon*²) of the ulna is lodged, when the arm is extended, here, too, is inserted the benumbing nerve, which arises from between the two bones of the fore-arm at their junction, and terminates there.

2 When the nose is fractured, the parts should be modeled instantly, if possible. If the fracture be in its cartilaginous part, introduce into the nostrils a tent formed of caddis, inclosed in the outer skin of a Carthaginian hide, or anything else which does not irritate, the skin is to be glued to the parts displaced, which are to be thus rectified. Bandaging in this case does mischief. The treatment is to consist of flour with manna, or of sulphur with cerate. You will immediately adjust the fragments, and afterward retain them in place with your fingers introduced into the nostrils, and turning the parts into place, then the Carthaginian skin is to be used. Callus forms even when there is a wound, and the same things are to be done, even when there is to be exfoliation of the bones, for this is not of a serious nature.

3 In fractures of the ears, neither bandages nor cataplasms should be used, or, if any bandage be used, it should be put on very tight, the cerate and sulphur, should be applied to agglutinate the bandages. When matter forms in the ears, it is found to be more deeply seated than might be supposed, for all parts that are pulpy, and consist of juicy flesh, prove deceptive in such a case. But no harm will result from making an opening, for the parts are lean, watery, and full of mucus. No mention is here made of the places and circumstances which render it fatal to make an opening. The cure is soonest effected by

transfixing the ear with a cautery, but the ear is maimed and diminished in size, if burned across. If opened, one of the gentle medicines for flesh wounds should be used as a dressing.

4 The jaw-bone is often slightly displaced (*subluxated?*), and is restored again, it is dislocated but rarely, especially in gaping, in fact, the bone is never dislocated unless it slips while the mouth is opened wide. It slips, however, the more readily from its ligaments being oblique, supple, and of a yielding nature. The symptoms are the lower jaw protrudes, it is distorted to the side opposite the dislocation, and the patient cannot shut his mouth, when both sides are dislocated, the jaw projects more, the mouth can be less shut, but there is no distortion, this is shown by the rows of the teeth in the upper and lower jaw corresponding with one another. If, then, both sides be dislocated, and not immediately reduced, the patient for the most part dies on the tenth day, with symptoms of continued fever, stupor, and coma, for the muscles there induce such effects, there is disorder of the bowels attended with scanty and unmixed dejections, and the vomitings, if any, are of the same character. The other variety is less troublesome. The method of reduction is the same in both.—The patient being laid down or seated, the physician is to take hold of his head, and grasping both sides of the jaw-bone with both hands, within and without, he must perform three manœuvres at once,—rectify the position of the jaw, push it backward, and shut the mouth. The treatment should consist of soothing applications, position, and applying a suitable bandage to support the jaw-bone, so as to co-operate with the reduction.

5 The bone of the shoulder is dislocated downward. I have never heard of any other mode. The parts put on the appearance of dislocation forward, when the flesh about the joint is wasted during consumption, as also seems to be the case with cattle when in a state of leanness after winter. Those persons are most liable to dislocations who are thin, slender, and have humidities about their joints without inflammation, for it knits the joints. Those who attempt to reduce and rectify dislocations in oxen, commit a blunder, as forgetting that the symptoms arise from the manner in which the ox uses the limb, and that the appearance

is the same in a man who is in a similar condition, and forgetting also that Homer has said, that oxen are most lean at that season. In this dislocation, then, when not reduced, the patient cannot perform any of those acts which others do, by raising the arm from the side. I have thus stated who are the persons most subject to this dislocation, and how they are affected. In congenital dislocations the nearest bones are most shortened, as is the case with persons who are *weasel-armed*, the fore-arm less so, and the hand still less, the bones above are not affected. And the parts (near the seat of the injury) are most wasted in flesh, and this happens more especially on the side of the arm opposite the dislocation, and that during adolescence, yet in a somewhat less degree than in congenital cases. The deep-seated suppurations occur most frequently to new-born infants about the joint of the shoulder, and these produce the same consequences as dislocations. In adults, the bones are not so diminished in size, and justly, seeing that the others will not increase as in the former case, but wasting of the flesh takes place, for it is increased, and is diminished every day, and at all ages. And attention should be paid to the force of habit, and to the symptom produced by the tearing away of the acromion, whereby a void is left, which makes people suppose that the humerus is dislocated. The head of the humerus is felt in the armpit, and the patient cannot raise his arm, nor swing it to this side and that, as formerly. The other shoulder shows the difference. Modes of reduction.—The patient himself having placed his fist in the arm pit, pushes up the head of the humerus with it, and brings the hand forward to the breast. Another—Force it backward, so that you may turn it round. Another—Apply your head to the acromion, and your hands to the armpit, separate the head of the humerus (*from the side?*), and push the elbow in the opposite direction, or, instead of your knees, another person may turn aside the elbow, as formerly directed. Or, place the patient on your shoulder, with the shoulder in his armpit. Or, with the heel, something being introduced to fill up the hollow of the armpit, and using the right foot to the right shoulder. Or, with a pestle. Or, with the step of a ladder. Or, by rotation made with piece of wood stretched

below the arm Treatment —As to attitude, the arm placed by the side, the hand and shoulder raised, the bandaging and adjustment of the parts while in this attitude If not reduced, the top of the shoulder becomes attenuated

6 When the acromion is torn away, the appearance is the same as in dislocation of the shoulder, but there is no impediment, except that the bone does not return to its position The figure should be the same as in dislocation, both as regards bandaging and suspending the limb The bandaging according to rule

7 When partial displacement (*sub-luxation*?) takes place at the elbow, either inside or outside, but the sharp point (*olecranon*?) remains in the cavity of the humerus, make extension in a straight line, and push the projecting parts backward and to the sides

8 In complete dislocations to either side, make extension while the arm is in the position it is put in to be bandaged for a fracture, for thus the rounded part of the elbow will not form an obstacle to it Dislocation most commonly takes place inward The parts are to be adjusted by separating the bones as much as possible, so that the end of the humerus may not come in contact with the olecranon, but it is to be carried up and turned round, and not forced in a straight line, at the same time the opposite sides are to be pushed together, and the bones reduced to their place In these cases rotation of the elbow co-operates, that is to say, turning the arm into a state of supination and pronation, so much for the reduction With regard to the attitude in which it is to be put,—the hand is to be placed somewhat higher than the elbow, and the arm by the side, this position suits with it when slung from the neck, is easily borne, is its natural position, and one adapted for ordinary purposes, unless callus form improperly the callus soon forms Treatment —By bandages according to the common rule for articulations, and the point of the elbow is to be included in the bandage

9 The elbow, when luxated, induces the most serious consequences, fevers, pain, nausea, vomiting of pure bile, and this especially in dislocations backward, from pressure on the nerve which occasions numbness, next to it is dislocation forward

The treatment is the same. The reduction of dislocation backward is by extension and adaptation. The symptom of this variety, loss of the power of extension, of dislocation forward, loss of the power of flexion. In it a hard ball is to be placed in the bend of the elbow, and the fore-arm is to be bent over this while sudden extension is made.

10 Diastasis of the bones may be recognized by examining the part where the vein which runs along the arm divides.

11 In these cases callus is speedily formed. In congenital dislocations, the bones below the seat of the injury are shorter than natural, in this case, the greatest shortening is in the nearest, namely, those of the fore-arm, second, those of the hand, third, those of the fingers. The arm and shoulders are stronger, owing to the nourishment which they receive, and the other arm, from the additional work it has to perform, is still more strong. The wasting of the flesh, if the dislocation was outward, is on the inside, or if otherwise, on the side opposite the dislocation.

12 In dislocation at the elbow, whether outward or inward, extension is to be made with the fore-arm at right angles to the arm, the arm is to be suspended by a shawl passed through the armpit, and a weight is to be attached to the extremity of the elbow, or force is to be applied with the hands. The articular extremity being properly raised, the parts are to be adjusted with the palms of the hands, as in dislocations of the hands. It is to be bandaged, suspended in a sling, and placed, while in this attitude.

13 Dislocations backward are to be rectified with the palms of the hands along with sudden extension. These two acts are to be performed together, as in other cases of the kind. In dislocation forward, the arm is to bend around a ball of cloth, of proper size, and at the same time replaced.

14 If the displacement be on the other side both these operations are to be performed in effecting the adjustment of the arm. With regard to the treatment,—the position and the bandaging are the same as in the other cases. For all these cases may be reduced by ordinary distention.

15 With regard to the modes of reduction, some act upon the

principle of carrying the one piece of bone over the other, some by extension, and some by rotation these last consist in rapidly turning the arm to this side and that

16 The joint of the hand is dislocated inward or outward, but most frequently inward The symptoms are easily recognized, if inward, the patient cannot at all bend his fingers, but if outward, he cannot extend them Reduction —By placing the fingers above a table, extension and counter-extension are to be made by assistance, while, with the palm of the hand or the heel on the projecting bone, one presses forward, and from behind, upon the other bone, and lays some soft substance on it, and, if the dislocation be above, the hand is to be turned into a state of pronation, or, if backward, into a state of supination The treatment is to be conducted with bandages

17 The whole hand is dislocated either inward, or outward, but especially inward, or to this side or that Sometimes the epiphysis is displaced, and sometimes there is displacement (*diastasis*) of the one bone from the other Powerful extension is to be made in this case, and the projecting part is to be pressed upon, and counter-pressure made on the opposite side both modes being performed at the same time, both backward and laterally, either with the hands on a table, or with the heel. These accidents give rise to serious consequences and deformities, but in time the parts get so strong as to admit of being used The treatment consists of bandages comprehending the hand and fore-arm, and splints are to be applied as far as the fingers, when put in splints, they are to be more frequently loosed than in fractures, and more copious affusions of water are to be used

18 In congenital dislocations the hand becomes shortened, and the atrophy of the flesh is generally on the side opposite the dislocation In the adult the bones remain of their proper size

19 The symptoms of dislocation of the finger are obvious, and need not be described This is the mode of reduction —By stretching in a straight line, and making pressure on the projecting part, and counter-pressure, at the opposite side, on the other The proper treatment consists in the application of bandages When not reduced, the parts unite by callus outside of the joints

In congenital dislocations, and in those which occur during adolescence, the bones below the dislocation are shortened, and the flesh is wasted principally on the side opposite to the dislocation, in the adult the bones remain of their proper size

20 Dislocation at the hip-joint occurs in four modes, inward most frequently, outward next, the others of equal frequency The symptoms —The common, a comparison with the sound leg The peculiar symptoms of dislocations inward, the head of the bone is felt at the perineum, the patient cannot bend his leg as formerly, the limb appears elongated, and to a great extent, unless you bring both limbs into the middle space between them in making a comparison of them, and the foot and the knee are inclined outward If the dislocation has taken place from birth, or during one's growth, the thigh is shortened, the leg less so, and the others according to the same rule, the fleshy parts are atrophied, especially on the outside Such persons are afraid to stand erect, and crawl along on the sound limb, or, if compelled, they walk with one or two staves, and bear up the affected limb, and the smaller the limb so much the more easily do they walk If the accident happens to adults the bones remain of their proper size, but the flesh is wasted, as formerly described, the patients walk in a wriggling manner, like oxen, they are bent toward the flank, and the buttock on the uninjured side is prominent, for the uninjured limb must necessarily come below that it may support the body, whilst the other must be carried out of the way, as it cannot support the body, like those who have an ulcer in the foot They poise the body by means of a staff on the sound side, and grasp the affected limb with the hand above the knee so as to carry the body in shifting from one place to another If the parts below the hip-joint be used, the bones below are less atrophied, but the flesh more

21 The symptoms and attitudes in dislocation outward are the opposite, and the knee and foot incline a little inward When it is congenital, or occurs during adolescence, the bones do not grow properly, according to the same rule, the bone of the hip-joint is somewhat higher than natural, and does not grow proportionally In those who have frequent dislocations outward,

without inflammation, the limb is of a more humid (flabby?) temperament than natural, like the thumb, for it is the part most frequently dislocated, owing to its configuration, in what persons the dislocation is to a greater or less extent, and in what persons it is more difficultly or easily produced, in what there is reason to hope that it can be speedily reduced, and in what not, and the remedy for this, and in what cases the dislocation frequently happens, and treatment of this In dislocation outward from birth, or during adolescence, or from disease, (and it happens most frequently from disease, in which case there is sometimes exfoliation of the bone, but even where there is no exfoliation,) the patients experience the same symptoms, but to an inferior degree to those in dislocations inward, if properly managed so that in walking they can put the whole foot to the ground and lean to either side The younger the patient is, the greater care should be bestowed on him, when neglected, the case gets worse, when attended to, it improves, and, although there be atrophy in all parts of the limb, it is to a less extent

22 When there is a dislocation on both sides, the affections of the bones are the same, the flesh is well developed, except within, the nates protrude, the thighs are arched, unless there be sphacelus If there be curvature of the spine above the hip-joint, the patients enjoy good health, but the body does not grow, with the exception of the head

23 The symptoms of dislocation backward are —The parts before more empty, behind they protrude, the foot straight, flexion impossible, except with pain, extension least of all in these the limb is shortened They can neither extend the limb at the ham, nor at the groin, unless it be much raised, nor can they bend it The uppermost joint, in most cases, takes the lead this is common in joints, nerves, muscles, intestines, uteri, and other parts There the bone of the hip-joint is carried backward to the nates, and on that account it is shortened, and because the patient cannot extend it The flesh of the whole leg is wasted in all cases, in which most, and to what extent, has been already stated Every part of the body which performs its functional work is strong, but, if inactive, it gets into a bad

condition, unless its inactivity arise from fatigue, fever, or inflammation. And in dislocations outward, the limb is shortened, because the bone is lodged in flesh which yields, but, in dislocations inward, it is longer, because the bone is lodged on a projecting bone. Adults, then, who have this dislocation unreduced, are bent at the groins in walking, and the other ham is flexed, they scarcely reach the ground with the ball of the foot, they grasp the limb with the hand, and walk without a staff if they choose, if the staff be too long, their foot cannot reach the ground,—if they wish to reach the ground, they must use a short staff. There is wasting of the flesh in cases attended with pain, and the inclination of the leg is forward, and the sound leg in proportion. In congenital cases, or when in adolescence, or from disease, the bone is dislocated (under what circumstances will be explained afterward), the limb is particularly impaired, owing to the nerves and joints not being exercised, and the knee is impaired for the reasons stated. These persons, keeping the limb bent, walk with one staff or two. But the sound limb is in good flesh from usage.

24 In dislocations forward the symptoms are the opposite: a vacuity behind, a protuberance before, of all motions they can least perform flexion, and extension best, the foot is straight, the limb is of the proper length at the heel, at its extremity the foot a little turned up, they are especially pained at first. Of all these dislocations retention of urine occurs most frequently in this variety, because the bone is lodged among important nerves. The fore parts are stretched, do not grow, are diseased, and are obnoxious to premature decay, the back parts are wrinkled. In the case of adults, they walk erect, resting merely on the heel, and this they do decidedly if they can take great steps, but they drag it along, the wasting is least of all in this variety of dislocation, owing to their being able to use the limb, but the wasting is most behind. The whole limb being straighter than natural they stand in need of a staff on the affected side. When the dislocation is congenital, or has occurred during adolescence, if properly managed, the patient has the use of the limb as well as adults (otherwise?) have of it. But, if neglected, it is shortened

and extended, for in such cases the joint is generally ankylosed in a straight position. The diminution of the bones, and wasting of the fleshy parts, are analogous.

25 In reduction—the extension of the thigh is to be powerful, and the adjustment what is common in all such cases, with the hands, or a board, or a lever, which, in dislocations inward, should be round, and in dislocations outward, flat, but it is mostly applicable in dislocations outward. Dislocations inward are to be remedied by means of bladders, extending to the bare part of the thigh, along with extension and binding together of the limbs. The patient may be suspended, with his feet a little separated from one another, and then a person inserting his arm within the affected limb, is to suspend himself from it, and perform extension and readjustment at the same time, and this method is sufficient in dislocations forward and the others, but least of all in dislocations backward. A board fastened under the limb, like the board fastened below the arm in dislocations at the shoulder, answers in dislocations inward, but less so in the other varieties. Along with extension you will use pressure either with the foot, the hand, or a board, especially in dislocations forward and backward.

26 Dislocations at the knee are of a milder character than those of the elbow, owing to the compactness and regularity of the joint, and hence it is more readily dislocated and reduced. Dislocation generally takes place inward, but also outward and backward. The methods of reduction are—by circumflexion, or by rapid excalcitration, or by rolling a fillet into a ball, placing it in the ham, and then letting the patient's body suddenly drop down on his knees. This mode applies best in dislocations backward. Dislocations backward, like those of the elbows, may also be reduced by moderate extension. Lateral dislocations may be reduced by circumflexion or excalcitration, or by extension (but this is most applicable in dislocation backward), but also by moderate extension. The adjustment is what is common in all. If not reduced, in dislocations backward, they cannot bend the leg and thigh upon one another, but neither can they do this in the others except to a small extent, and the fore parts of the thigh

and leg are wasted In dislocations inward they are bandy-legged, and the external parts are atrophied But, in dislocations outward, they incline more outward, but are less lame, for the body is supported on the thicker bone, and the inner parts are wasted The consequences of a congenital dislocation, or one occurring during adolescence, are analogous to the rule formerly laid down

27 Dislocations at the ankle-joint require strong extension, either with the hands or some such means, and adjustment, which at the same time effects both acts, this is common in all cases

28 Dislocations of the bones of the foot are to be treated like those of the hand

29 Dislocations of the bones connected with the leg, if not reduced, whether occurring at birth or during adolescence, are of the same character as those in the hand

30 Persons who, in jumping from a height, have pitched on the heel, so as to occasion diastasis (separation) of the bones, ecchymosis of the veins, and contusion of the nerves,—when these symptoms are very violent, there is danger that the parts may sphacelate, and give trouble to the patient during the remainder of his life, for these bones are so constructed as to slip past one another, and the nerves communicate together And, likewise, in cases of fracture, either from an injury in the leg or thigh, or in paralysis of the nerves connected with these parts, or, when in any other case of confinement to bed the heel, from neglect, becomes blackened, in all these cases serious effects result therefrom Sometimes, in addition to the sphacelus, very acute fevers supervene, attended with hiccup, tumors, aberration of intellect, and speedy death, along with lividity of the large blood-vessels, and gangrene The symptoms of the exacerbations are these if the ecchymosis, the blackened parts, and those around them, be somewhat hard and red, and if lividity be combined with the hardness, there is danger of mortification, but, if the parts are sublivid, or even very livid and diffused, or greenish and soft, these symptoms, in all such cases, are favorable The treatment consists in the administration of hellebore, if they be free from fever, but otherwise, they are to have *oxyglyky* for drink, if re-

quired Bandaging,—agreeably to the rule in other joints, but this is to be attended to also,—the bandages should be numerous, and softer than usual, compression less, more water than usual to be used in the affusions, to be applied especially to the heel. The same object should be sought after in the position as in the bandaging, namely, that the humors may not be determined to the heel, the limb to be well laid should have the heel higher than the knee. Splints not to be used.

31 When the foot is dislocated, either alone, or with the epiphysis, the displacement is more apt to be inward. If not reduced, in the course of time the parts of the hips, thigh, and leg, opposite the dislocation, become attenuated. Reduction — As in dislocation at the wrist, but the extension requires to be very powerful. Treatment — Agreeably to the rule laid down for the other joints. Less apt to be followed by serious consequences than the wrist, if kept quiet. Diet restricted, as being in an inactive state. Those occurring at birth, or during adolescence, observe the rule formerly stated.

32 With regard to slight congenital dislocations, some of them can be rectified, especially club-foot. There is more than one variety of club-foot. The treatment consists in modeling the foot like a piece of wax, applying resinous cerate, and numerous bandages, or a sole, or a piece of lead is to be bound on, but not upon the bare skin, the adjustment and attitudes to correspond.

33 If the dislocated bones cause a wound in the skin, and protrude, it is better to let them alone, provided only they are not allowed to hang, nor are compressed. The treatment consists in applying pitched cerate, or compresses dipped in hot wine (for cold is bad in all such cases), and certain leaves, but in winter unwashed wool may be applied as a cover to the part, neither cataplasms nor bandaging, restricted diet. Cold, great weight, compression, violence, restricted position, all such are to be accounted as fatal measures. When treated moderately (they escape), maimed and deformed, for, if the dislocation be at the ankle, the foot is drawn upward, and, if elsewhere, according to the same rule. The bones do not readily exfoliate, for only small portions of them are denuded, and they heal by narrow

cicatrices The danger is greatest in the greatest joints, and those highest up The only chance of recovery is, if they are not reduced, except at the fingers and hand, and in these cases the danger should be announced beforehand Attempts at reduction to be made on the first or second day, or, if not accomplished then, on the tenth, by no means on the fourth Reduction by levers Treatment —As in injuries of the bones of the head, and the part is to be kept hot, and it is better to give hellebore immediately after the parts have been reduced With regard to the other bones, it should be well known, that, if replaced, death will be the consequence, the more surely and expeditiously, the greater the articulation, and the more high its situation Dislocation of the foot is attended with spasm (tetanus) and gangrene, and if, upon its being replaced, any of these symptoms come on, the chance of recovery, if there be any chance, is in displacing it anew, for spasms do not arise from relaxation, but from tension of the parts

34 Excision, either of articular bones or of pieces of bones, when not high up in the body, but about the foot or the hand, is generally followed by recovery, unless the patient die at once from *deliquium animi* Treatment —As in injuries of the head, warmth

35 Sphacelus of the fleshy parts is produced by the tight compression of bleeding wounds, and by pressure in the fractures of bones, and by blackening, arising from bandages And in those cases in which a portion of the thigh or arm, both the bones and the flesh drop off, many recover, the case being less dangerous than many others In cases, then, connected with fracture of the bones, the separation of the flesh quickly takes place, but the separation of the bone, at the boundary of its denuded part, is slower in taking place But the parts below the seat of the injury, and the sound portion of the body, are to be previously taken away (for they die previously), taking care to avoid producing pain, for *deliquium animi* may occasion death The bone of the thigh in such a case came away on the eightieth day, but the leg was removed on the twentieth day The bones of the leg, in a certain case, came away at the middle of the sixtieth

day In these cases the separation is quick or slow, according to the compression applied by the physician When the compression is gently applied the bones do not drop off at all, neither are they denuded of flesh, but the gangrene is confined in the more superficial parts The treatment of such cases must be undertaken, for most of them are more formidable in appearance than in reality The treatment should be mild, but, with a restricted diet, hemorrhages and cold are to be dreaded, the position, so as that the limb may be inclined upward, and afterward, on account of the purulent abscess, horizontally, or such as may suit with it In such cases, and in mortifications, there are, usually, about the crisis, hemorrhages and violent diarrhœas, which, however, only last for a few days, the patients do not lose their appetite, neither are they feverish, nor should they be put upon a reduced diet

36 Displacement of the spine, if inward, threatens immediate death, attended with retention of urine and loss of sensibility Outward, the accident is free from most of these bad effects, much more so than where there is merely concussion without displacement, the effects in the former case being confined to the spot affected, whereas in the latter they are further communicated to the whole body, and are of a mortal character In like manner, when the ribs are fractured, whether one or more, provided there be no splinters, there is rarely fever, spitting of blood, and sphacelus, and ordinary treatment without evacuation will suffice, provided there be no fever,—bandaging, according to rule, and the callus forms in twenty days, the bone being of a porous nature But in cases of contusion, tubercles form, along with cough, suppurating sores, and sphacelus of the ribs, for nerves from all the parts run along each rib In many of these cases hæmoptysis and empyema also take place The management of this case consists in careful treatment, bandaging according to rule, diet at first restricted, but afterward more liberal, quiet, silence, position, bowels, and venereal matters regulated Even when there is no spitting of blood, these contusions are more painful than fractures, and are more subject in time to relapses, and when any mucous collection is left in the part, it makes itself be felt in disorders of the body Treatment —burning, when the bone is

affected, down to the bone, but not touching the bone itself, if in the intercostal space, the burning must not extend through it, nor be too superficial. In sphacelus of the ribs, tents are to be tried, all other particulars will be stated afterward but they should be learned by sight rather than by words, namely, food, drink, heat, cold, attitude, medicines, dry, liquid, red, dark, white, sour, for the ulcers, and so with regard to the diet.

37 Displacements (*of the vertebræ*) from a fall rarely admit of being rectified, and those above the diaphragm are most difficult to rectify. When the accident happens to children, the body does not grow, with the exception of the legs, the arms, and head. Excurvation, in adults, speedily relieves the individual from the disease he is laboring under, but in time it renews its attack, with the same symptoms as in children, but of a less serious nature. Some individuals have borne this affection well, and have turned out to be brawny and fat. But few of them have lived to the age of sixty. Lateral curvatures also occur, the proximate cause of which is the attitudes in which these persons lie. These cases have their prognostics accordingly.

38 The rule for the reduction and adjustment — The axle, the lever, the wedge, pressure above, the axle to separate, the lever to push aside. Reduction and adjustment are to be accomplished by forcible extension, the parts being placed in such a position as will facilitate the conveying of the displaced bone over the extremity of the bone from which it was displaced. This is to be accomplished either with the hands, or by suspension, or axles, or turned round something. With the hands this is to be effected properly, according to the structure of the parts. In the case of the wrist and elbow, the parts are to be forced asunder, at the wrist in the line of the elbow, and the elbow with the fore-arm at a right angle with the arm, as when it is suspended in a sling. When we want to separate the protruding bones, and force them into place, in the case of the fingers, the toes, or the wrist, the proper separation may be made by hands, while the projecting part is forced into its place by pressing down with the heel or the palm of the hand upon some resisting object, while something moderately soft is laid under the projecting part, but nothing

such under the other, and then pressure is to be made backward and downward, whether the dislocation be inward or outward. In lateral displacement, pressure and counter-pressure must be made on the opposite sides. Displacements forward can be reduced neither by sneezing, nor coughing, nor by the injection of air, nor by the cupping-instrument, and if anything can do good in such a case, it is extension. People are deceived in fractures of the spinal processes, the pain of which causing the patient to stoop forward, the case is taken for dislocation inward, these fractures heal speedily and easily. Dislocation outward is to be remedied by succussion, when high up, toward the feet, and when situated low down, in the contrary direction, the part is to be pressed back into its place, either with the foot or a board. Dislocations to either side, if they admit of any remedy, are to be treated by extension, and suitable attitudes, with regimen. The whole apparatus should be broad, soft, and strong, or otherwise, they should be wrapped in rags, before being used, they should all be prepared proportionately to the length, height, and breadth. In applying extension to the thigh, for example, the bands should be fastened at the ankle and above the knee, these stretching in the same direction, another band to be passed by the loins, and around the armpits, and by the perineum and thigh, one end passing up the breast and the other along the back, these all stretching in the same direction and being fastened either to a piece of wood resembling a pestle or to an axle. When this is done on a couch, either of its feet is to be fastened to the threshold, and a strong block of wood is to be laid across the other, and the pieces of wood resembling a pestle are to be raised on these, to make extension and counter-extension, the naves of a wheel are to be fastened in the floor, or a ladder is to be adjusted, so that extension may be made in both directions. The thing commonly used is a bench six cubits long, two cubits broad, one fathom in thickness, having two low axles at this end and that, and having at its middle two moderate-sized pillars, to which is to be adjusted a transverse piece of wood like the step of a ladder, which is to receive the piece of wood tied below the limb, as is done in dislocation at the shoulder, and the bench is to have

excavations like trays, smooth, four inches in breadth and depth, and at such an interval as to leave room for the lever used to reduce the limb. In the middle of the bench a square hole is to be scooped out to receive a small pillar, which, being adjusted to the perineum, will obviate the tendency of the body to slip downward, and being rather loose may act somewhat as a lever. In certain occasions a piece of wood is required, which is inserted into a hole scooped out of the wall, the other end of it is then to be pressed down, something moderately soft being placed under it.

39 In those cases where the bone of the palate has exfoliated, the nose sinks in its middle. In contusions of the head without a wound, either from a fall, a fracture, or pressure, in certain of these cases acrid humors descend from the head to the throat, and from the wound in the head to the liver and thigh.

40 The symptoms of sub-luxations and luxations, and where, and how, and how much these differ from one another. And the cases in which the articular cavity has been broken off, and in which the ligament has been torn, and in which the epiphysis has been broken off, and in which, and how, when the limb consists of two bones, one or both are broken. In consequence of these the dangers, chances in which bad, and when the injuries will result in death, and when in recovery. What cases are to be reduced or attempted, and when, and which, and when not, the hopes and dangers in these cases. Which and when congenital dislocations are to be undertaken. The parts in a state of growth, the parts fully grown, and why sooner, or slower. And why a part becomes maimed, and how, and how not. And why a certain part is atrophied, and where, and how, and in what cases to a less extent. And why fractured parts unite sooner or slower, how distortions and callosities form, and the remedy for them. In what cases there are external wounds, either at first or afterwards. In what fractures the bones are shortened, and in what not. In what cases the fractured bones protrude, and when they protrude most. In what cases dislocated bones protrude. That physicians are deceived, and by what means, in what they see, and in what they devise, regarding affections, and regarding cures. Established rules with regard to bandaging.

preparation, presentation of the part, extension, adjustment, friction, bandaging, suspension and placing of the limb, attitude, seasons, diet The most porous parts heal fastest, and *vice versa* Distortions, where the bones are crooked Flesh and tendons wasted on the side of the dislocation The force used in reduction to be applied at as great a distance as possible from the seat of the displacement Of nerves (*ligaments*²), those which are in motion and in humidity (*flabby*²) are of a yielding nature, those that are not, less so In every dislocation the most speedy reduction is best Reduction not to be made while the patient is in a febrile state, nor on the fourth or fifth day, and least of all, in those of the elbow, and all cases which induce torpor, the soonest the best, provided the inflammatory stage be avoided Parts torn asunder, whether nerves, or cartilages, or epiphyses, or parts separated at symphyses, cannot possibly be restored to their former state, but callus is quickly formed in most cases, yet the use of the limb is preserved Of luxations, those nearest the extremities are least dangerous Those joints which are most easily dislocated are the least subject to inflammation Those which have been least inflamed, and have not been subjected to after-treatment, are most liable to be dislocated anew Extension should be made in the position most calculated to enable the one bone to clear the extremity of the other, attention being paid to configuration and place Adjustment to be made in the direction of the displacement, to push the displaced limb straight backward and sideways Parts suddenly drawn aside are to be suddenly drawn back by a rotatory motion Articulations which have been oftenest dislocated are the most easily reduced, the cause is the conformation of the nerves (*ligaments*²) or of the bones, of the ligaments that they are long and yielding, and of the bones, the shallowness of the articular cavity, and roundness of the head [of the bone that enters it] Usage, by its friction, forms a new socket The cause—the disposition, and habit, and age A part somewhat mucous is not subject to inflammation

41 In those cases where there are wounds, either at first, or from protrusion of the bones, or afterward, from pruritus, or

irritation, in the latter case you are immediately to unloose the bandages, and having applied pitched cerate to the wound, bandage the limb, placing the head of the roller upon the wound, and proceeding otherwise as if there were no wound in the case, for thus will the swelling be reduced as much as possible, and the wound will suppurate most quickly, and the diseased parts will separate, and when it becomes clean the wound will most quickly heal. Splints are not to be applied to the place, nor is it to be bound tight. Proceed thus when no large bones exfoliate, but not in the latter case, for then there is great suppuration, and the same treatment is not applicable, but the parts require to be exposed to the air on account of the abscesses. In such cases where the bones protrude, and whether reduced or not, bandaging is not befitting, but distention is to be practiced by means of rolls of cloth, made like those used upon shackles, one of these is to be placed at the ankle, and the other at the knee, they are to be flattened toward the leg, soft, strong, and having rings, and rods made of cornel, and of a proper length and thickness are to be adjusted to them, so as to keep the parts distended, and straps, attached to both extremities, are to be inserted into the rings, so that the extremities being fixed into the rolls, may effect distention. Treatment—Pitched cerate, in a hot state, the attitudes, position of the foot and hip, regulated diet. The bones which have protruded through the skin are to be replaced the same day, or next, not on the fourth or fifth, but when the swelling has subsided. Reduction is to be performed with levers, when the bone does not present any place upon which the lever can rest, a portion of the part which prevents this is to be sawed off. But the denuded parts will drop off, and the limb become shortened.

42 Dislocations at the joints are to a greater and less extent. Those that are to a less extent are the most easily reduced, those that are to a greater extent occasion lesions of the bones, of the ligaments, of the joints, of the fleshy parts, and of the attitudes. The thigh and arm resemble one another very much in their dislocations.

MEDICAL CLASSICS

VOL 3

November, 1938

NO 3



CONTENTS

Works of Hippocrates

Aphorisms - - - - -	299
The Law - - - - -	331
On Ulcers - - - - -	333
On Fistulæ - - - - -	345
On Hemorrhoids - - - - -	351
On the Sacred Disease - - - - -	355

MEDICAL CLASSICS

VOL. 3

November, 1938

NO 3



Aphorisms

SECTION I



IFE is short, and the Art long, the occasion fleeting, experience fallacious, and judgment difficult. The physician must not only be prepared to do what is right himself, but also to make the patient, the attendants, and externals co-operate.

2. In disorders of the bowels and vomitings, occurring spontaneously, if the matters purged be such as ought to be purged, they do good, and are well borne, but if not, the contrary. And so artificial evacuations, if they consist of such matters as should be evacuated, do good, and are well borne, but if not, the contrary. One, then, ought to look to the country, the season, the age, and the diseases in which they are proper or not.

3. In the *athletæ*, *embonpoint*, if carried to its utmost limit, is dangerous, for they cannot remain in the same state nor be stationary, and since, then, they can neither remain stationary nor improve, it only remains for them to get worse, for these reasons the *embonpoint* should be reduced without delay, that the body may again have a commencement of reparation. Neither should the evacuations, in their case, be carried to an extreme, for this also is dangerous, but only to such a point as the person's constitution can endure. In like manner, medicinal evacuations, if carried to an extreme, are dangerous, and again, a restorative course, if in the extreme, is dangerous.

4. A slender and restricted diet is always dangerous in chronic diseases, and also in acute diseases, where it is not requisite. And again, a diet brought to the extreme point of attenuation is

dangerous, and repletion, when in the extreme, is also dangerous

5 In a restricted diet, patients who transgress are thereby more hurt (than in any other^d), for every such transgression, whatever it may be, is followed by greater consequences than in a diet somewhat more generous. On this account, a very slender, regulated, and restricted diet is dangerous to persons in health, because they bear transgressions of it more difficultly. For this reason, a slender and restricted diet is generally more dangerous than one a little more liberal.

6 For extreme diseases, extreme methods of cure, as to restriction, are most suitable.

7 When the disease is very acute, it is attended with extremely severe symptoms in its first stage, and therefore an extremely attenuating diet must be used. When this is not the case, but it is allowable to give a more generous diet, we may depart as far from the severity of regimen as the disease, by its mildness, is removed from the extreme.

8 When the disease is at its height, it will then be necessary to use the most slender diet.

9 We must form a particular judgment of the patient, whether he will support the diet until the acme of the disease, and whether he will sink previously and not support the diet, or the disease will give way previously, and become less acute.

10 In those cases, then, which attain their acme speedily, a restricted diet should be enjoined at first, but in those cases which reach their acme later, we must retrench at that period or a little before it, but previously we must allow a more generous diet to support the patient.

11 We must retrench during paroxysms, for to exhibit food would be injurious. And in all diseases having periodical paroxysms, we must restrict during the paroxysms.

12 The exacerbations and remissions will be indicated by the diseases, the seasons of the year, the reciprocation of the periods, whether they occur every day, every alternate day, or after a longer period, and by the supervening symptoms, as, for example, in pleuritic cases, expectoration, if it occur at the commencement, shortens the attack, but if it appear later, it prolongs the same,

and in the same manner the urine, and alvine discharges, and sweats, according as they appear along with favorable or unfavorable symptoms, indicate diseases of a short or long duration

13 Old persons endure fasting most easily, next, adults, young persons not nearly so well, and most especially infants, and of them such as are of a particularly lively spirit

14 Growing bodies have the most innate heat, they therefore require the most food, for otherwise their bodies are wasted In old persons the heat is feeble, and therefore they require little fuel, as it were, to the flame, for it would be extinguished by much On this account, also, fevers in old persons are not equally acute, because their bodies are cold

15 In winter and spring the bowels are naturally the hottest, and the sleep most prolonged, at these seasons, then, the most sustenance is to be administered, for as the belly has then most innate heat, it stands in need of most food The well-known facts with regard to young persons and the *athletæ* prove this

16 A humid regimen is befitting in all febrile diseases, and particularly in children, and others accustomed to live on such a diet

17 We must consider, also, in which cases food is to be given once or twice a day, and in greater or smaller quantities, and at intervals Something must be conceded to habit, to season, to country, and to age

18 Invalids bear food worst during summer and autumn, most easily in winter, and next in spring

19 Neither give nor enjoin anything to persons during periodical paroxysms, but abstract from the accustomed allowance before the crisis

20 When things are at the crisis, or when they have just passed it, neither move the bowels, nor make any innovation in the treatment, either as regards purgatives or any other such stimulants, but let things alone

21 Those things which require to be evacuated should be evacuated, wherever they most tend, by the proper outlets

22 We must purge and move such humors as are concocted, not such as are unconcocted, unless they are struggling to get out, which is mostly not the case

23 The evacuations are to be judged of not by their quantity,

but whether they be such as they should be, and how they are borne And when proper to carry the evacuation to *deliquium animi*, this also should be done, provided the patient can support it

24 Use purgative medicines sparingly in acute diseases, and at the commencement, and not without proper circumspection

25 If the matters which are purged be such as should be purged, the evacuation is beneficial, and easily borne, but, if otherwise, with difficulty

SECTION II

1 In whatever disease sleep is laborious, it is a deadly symptom, but if sleep does good, it is not deadly

2 When sleep puts an end to delirium, it is a good symptom

3 Both sleep and insomnolency, when immoderate, are bad

4 Neither repletion, nor fasting, nor anything else, is good when more than natural

5 Spontaneous lassitude indicates disease

6 Persons who have a painful affection in any part of the body, and are in a great measure insensible of the pain, are disordered in intellect

7 Those bodies which have been slowly emaciated should be slowly recruited, and those which have been quickly emaciated should be quickly recruited

8 When a person after a disease takes food, but does not improve in strength, it indicates that the body uses more food than is proper, but if this happen when he does not take food, it is to be understood that evacuation is required

9 When one wishes to purge, he should put the body into a fluent state

10. Bodies not properly cleansed, the more you nourish the more you injure

11. It is easier to fill up with drink than with food

12 What remains in diseases after the crisis is apt to produce relapses

13 Persons in whom a crisis takes place pass the night preced-

ing the paroxysm uncomfortably, but the succeeding night generally more comfortably.

14 In fluxes of the bowels, a change of the dejections does good, unless the change be of a bad character

15 When the throat is diseased, or tubercles (*phymata*) form on the body, attention must be paid to the secretions, for if they be bilious, the disease affects the general system, but if they resemble those of a healthy person, it is safe to give nourishing food

16 When in a state of hunger, one ought not to undertake labor.

17 When more food than is proper has been taken, it occasions disease, this is shown by the treatment

18 From food which proves nourishing to the body either immediately or shortly, the dejections also are immediate

19 In acute diseases it is not quite safe to prognosticate either death or recovery

20 Those who have watery discharges from their bowels when young have dry when they are old, and those who have dry discharges when they are young will have watery when they are old

21 Drinking strong wine cures hunger

22 Diseases which arise from repletion are cured by depletion, and those that arise from depletion are cured by repletion, and in general, diseases are cured by their contraries

23 Acute disease come to a crisis in fourteen days

24 The fourth day is indicative of the seventh, the eighth is the commencement of the second week, and hence, the eleventh being the fourth of the second week, is also indicative, and again, the seventeenth is indicative, as being the fourth from the fourteenth, and the seventh from the eleventh

25 The summer quartans are, for the most part, of short duration, but the autumnal are protracted, especially those occurring near the approach of winter

26 It is better that a fever succeed to a convulsion, than a convulsion to a fever

27 We should not trust ameliorations in diseases when they are not regular, nor be much afraid of bad symptoms which occur in an irregular form, for such are commonly inconstant, and do not usually continue, nor have any duration

28 In fevers which are not altogether slight, it is a bad symptom for the body to remain without any diminution of bulk, or to be wasted beyond measure, for the one state indicates a protracted disease, and the other weakness of body

29 If it appear that evacuations are required, they should be made at the commencement of diseases, at the acme it is better to be quiet

30 Toward the commencement and end of diseases all the symptoms are weaker, and toward the acme they are stronger

31 When a person who is recovering from a disease has a good appetite, but his body does not improve in condition, it is a bad symptom

32 For the most part, all persons in ill health, who have a good appetite at the commencement, but do not improve, have a bad appetite again toward the end, whereas, those who have a very bad appetite at the commencement, and afterward acquire a good appetite, get better off

33 In every disease it is a good sign when the patient's intellect is sound, and he is disposed to take whatever food is offered to him, but the contrary is bad

34 In diseases, there is less danger when the disease is one to which the patient's constitution, habit, age, and the season are allied, than when it is one to which they are not allied

35 In all diseases it is better that the umbilical and hypogastric regions preserve their fullness, and it is a bad sign when they are very slender and emaciated, in the latter case it is dangerous to administer purgatives

36 Persons in good health quickly lose their strength by taking purgative medicines, or using bad food

37 Purgative medicines agree ill with persons in good health

38 An article of food or drink which is slightly worse, but more palatable, is to be preferred to such as are better but less palatable

39 Old people, on the whole, have fewer complaints than young; but those chronic diseases which do befall them generally never leave them

40 Catarrhs and coryzæ in very old people are not concocted.

41 Persons who have had frequent and severe attacks of swooning, without any manifest cause, die suddenly

42 It is impossible to remove a strong attack of apoplexy, and not easy to remove a weak attack

43 Of persons who have been suspended by the neck, and are in a state of insensibility, but not quite dead, those do not recover who have foam at the mouth

44 Persons who are naturally very fat are apt to die earlier than those who are slender

45 Epilepsy in young persons is most frequently removed by changes of air, of country, and of modes of life

46 Of two pains occurring together, not in the same part of the body, the stronger weakens the other

47 Pains and fevers occur rather at the formation of pus than when it is already formed

48 In every movement of the body, whenever one begins to endure pain, it will be relieved by rest

49 Those who are accustomed to endure habitual labors, although they be weak or old, bear them better than strong and young persons who have not been so accustomed

50 Those things which one has been accustomed to for a long time, although worse than things which one is not accustomed to, usually give less disturbance, but a change must sometimes be made to things one is not accustomed to

51 To evacuate, fill up, heat, cool, or otherwise, move the body in any way much and suddenly, is dangerous, and whatever is excessive is inimical to nature, but whatever is done by little and little is safe, more especially when a transition is made from one thing to another

52 When doing everything according to indications, although things may not turn out agreeably to indication, we should not change to another while the original appearances remain

53 Those persons who have watery discharges from the bowels

when they are young, come off better than those who have dry, but in old age they come off worse, for the bowels in aged persons are usually dried up

54 Largeness of person in youth is noble and not unbecoming, but in old age it is inconvenient, and worse than a smaller structure

SECTION III

1 The changes of the season mostly engender diseases, and in the seasons great changes either of heat or of cold, and the rest agreeably to the same rule

2 Of natures (*temperaments*?), some are well- or ill-adapted for summer, and some for winter

3 Of diseases and ages, certain of them are well- or ill-adapted to different seasons, places, and kinds of diet

4 In the seasons, when during the same day there is at one time heat and at another time cold, the diseases of autumn may be expected

5 South winds induce dullness of hearing, dimness of visions, heaviness of the head, torpor, and languor, when these prevail, such symptoms occur in diseases But if the north wind prevail, coughs, affections of the throat, hardness of the bowels, dysuria attended with rigors, and pains of the sides and breast occur. When this wind prevails, all such symptoms may be expected in diseases

6 When summer is like spring, much sweating may be expected in fevers

7 Acute diseases occur in droughts, and if the summer be particularly such, according to the constitution which it has given to the year, for the most part such diseases may be expected

8 In seasons which are regular, and furnish the productions of the season at the seasonable time, the diseases are regular, and come readily to a crisis, but in inconstant seasons, the diseases are irregular, and come to a crisis with difficulty

9 In autumn, diseases are most acute, and most mortal, on the whole The spring is most healthy, and least mortal

10 Autumn is a bad season for persons in consumption

11 With regard to the seasons, if the winter be of a dry and northerly character, and the spring rainy and southerly, in summer there will necessarily be acute fevers, ophthalmies, and dysenteries, especially in women, and in men of a humid temperament

12 If the winter be southerly, rainy, and calm, but the spring dry and northerly, women whose term of delivery should be in spring, have abortions from any slight cause, and those who reach their full time, bring forth children who are feeble, and diseased, so that they either die presently, or, if they live, are puny and unhealthy Other people are subject to dysenteries and ophthalmies, and old men to catarrhs, which quickly cut them off

13 If the summer be dry and northerly and the autumn rainy and southerly, headaches occur in winter, with coughs, hoarse-nesses, coryzæ, and in some cases consumptions

14 But if the autumn be northerly and dry, it agrees well with persons of a humid temperament, and with women, but others will be subject to dry ophthalmies, acute fevers, coryzæ, and in some cases melancholy

15 Of the constitutions of the year, the dry, upon the whole, are more healthy than the rainy, and attended with less mortality.

16 The diseases which occur most frequently in rainy seasons are, protracted fevers, fluxes of the bowels, mortifications, epilepsies, apoplexies, and quinsies, and in dry, consumptive diseases, ophthalmies, arthritic diseases, stranguries, and dysenteries.

17 With regard to the states of the weather which continue but for a day, that which is northerly, braces the body, giving it tone, agility, and color, improves the sense of hearing, dries up the bowels, pinches the eyes, and aggravates any previous pain which may have been seated in the chest But the southerly relaxes the body, and renders it humid, brings on dullness of hearing, heaviness of the head, and vertigo, impairs the movements of the eyes and the whole body, and renders the alvine discharges watery

18 With regard to the seasons, in spring and in the commencement of summer, children and those next to them in age are most

comfortable, and enjoy best health, in summer and during a certain portion of autumn, old people, during the remainder of the autumn and in winter, those of the intermediate ages

19 All diseases occur at all seasons of the year, but certain of them are more apt to occur and be exacerbated at certain seasons

20 The diseases of spring are, maniacal, melancholic, and epileptic disorders, bloody flux, quinsy, coryza, hoarseness, cough, leprosy, lichen alphas, exanthemata mostly ending in ulcerations, tubercles, and arthritic diseases

21 Of summer, certain of these, and continued, ardent, and tertian fevers, most especially vomiting, diarrhœa, ophthalmy, pains of the ears, ulcerations of the mouth, mortifications of the privy parts, and the sudamina

22 Of autumn, most of the summer, quartan, and irregular fevers, enlarged spleen, dropsy, phthisis, strangury, hientery, dysentery, sciatica, quinsy, asthma, ileus, epilepsy, maniacal and melancholic disorders

23 Of winter, pleurisy, pneumonia, coryza, hoarseness, cough, pains of the chest, pains of the ribs and loins, headache, vertigo, and apoplexy

24 In the different ages the following complaints occur to little and new-born children, aphthæ, vomiting, coughs, sleeplessness, frights, inflammation of the navel, watery discharges from the ears

25 At the approach of dentition, pruritus of the gums, fevers, convulsions, diarrhœa, especially when cutting the canine teeth, and in those who are particularly fat, and have constipated bowels

26 To persons somewhat older, affections of the tonsils, incurvation of the spine at the vertebra next the occiput, asthma, calculus, round worms, ascarides, acrochordon, satyriasmus, struma, and other tubercles (phymata), but especially the aforesaid

27 To persons of a more advanced age, and now on the verge of manhood, the most of these diseases, and, moreover, more chronic fevers, and epistaxis

28 Young people for the most part have a crisis in their complaints, some in forty days, some in seven months, some in seven years, some at the approach to puberty, and such complaints of children as remain, and do not pass away about puberty, or in females about the commencement of menstruation, usually become chronic

29 To persons past boyhood, hæmoptysis, phthisis, acute fevers, epilepsy, and other diseases, but especially the aforementioned

30 To persons beyond that age, asthma, pleurisy, pneumonia, lethargy, phrenitis, ardent fevers, chronic diarrhœa, cholera, dysentery, hientery, hæmorrhoids

31 To old people dyspnœa, catarrhs accompanied with coughs, dysuria, pains of the joints, nephritis, vertigo, apoplexy, cachexia, pruritus of the whole body, insomnolency, defluxions of the bowels, of the eyes, and of the nose, dimness of sight, cataract (glaucoma), and dullness of hearing

SECTION IV

1 We must purge pregnant women, if matters be turgid (in a state of orgasm?), from the fourth to the seventh month, but less freely in the latter, in the first and last stages of pregnancy it should be avoided

2 In purging we should bring away such matters from the body as it would be advantageous had they come away spontaneously, but those of an opposite character should be stopped.

3 If the matters which are purged be such as should be purged, it is beneficial and well borne, but if the contrary, with difficulty.

4 We should rather purge upward in summer, and downward in winter

5 About the time of the dog-days, and before it, the administration of purgatives is unsuitable.

6 Lean persons who are easily made to vomit should be purged upward, avoiding the winter season

7 Persons who are difficult to vomit, and are moderately fat, should be purged downward, avoiding the summer season

8 We must be guarded in purging phthisical persons upward

9 And from the same mode of reasoning, applying the opposite rule to melancholic persons, we must purge them freely downward

10 In very acute diseases, if matters be in a state of orgasm, we may purge on the first day, for it is a bad thing to procrastinate in such cases

11 Those cases in which there are tormina, pains about the umbilicus, and pains about the loins, not removed either by purgative medicines or otherwise, usually terminate in dry dropsy

12 It is a bad thing to purge upward in winter persons whose bowels are in a state of hientery

13 Persons who are not easily purged upward by the hellebores, should have their bodies moistened by plenty of food and rest before taking the draught

14 When one takes a draught of hellebore, one should be made to move more about, and indulge less in sleep and repose. Sailing on the sea shows that motion disorders the body

15 When you wish the hellebore to act more, move the body, and when to stop, let the patient get sleep and rest

16 Hellebore is dangerous to persons whose flesh is sound, for it induces convulsion

17 Anorexia, heartburn, vertigo, and a bitter taste of the mouth, in a person free from fever, indicate the want of purging upward

18 Pains seated above the diaphragm indicate purging upward, and those below it, downward

19 Persons who have no thirst while under the action of a purgative medicine, do not cease from being purged until they become thirsty

20 If persons free from fever be seized with tormina, heaviness of the knees, and pains of the loins, this indicates that purging downward is required

21 Alvine dejections which are black, like blood, taking place spontaneously, either with or without fever, are very bad, and the more numerous and unfavorable the colors, so much the worse, when with medicine it is better, and a variety of colors in this case is not bad

22 When black bile is evacuated in the beginning of any disease whatever, either upward or downward, it is a mortal symptom

23 In persons attenuated from any disease, whether acute or chronic, or from wounds, or any other cause, if there be a discharge either of black bile, or resembling black blood, they die on the following day

24 Dysentery, if it comence with black bile, is mortal

25 Blood discharged upward, whatever be its character, is a bad symptom, but downward it is (more?) favorable, and so also black dejections

26 If in a person ill of dysentery, substances resembling flesh be discharged from the bowels, it is a mortal symptom

27 In whatever cases of fever there is a copious hemorrhage from whatever channel, the bowels are in a loose state during convalescence

28 In all cases whatever, bilious discharges cease if deafness supervenes, and in all cases deafness ceases when bilious discharges supervene

29 Rigors which occur on the sixth day have a difficult crisis

30 Diseases attended with paroxysms, if at the same hour that the fever leaves it return again next day, are of difficult crisis

31 In febrile diseases attended with a sense of lassitude, deposits form about the joints, and especially those of the jaws

32 In convalescents from diseases, if any part be pained, there deposits are formed

33 But if any part be in a painful state previous to the illness, there the disease fixes

34 If a person laboring under a fever, without any swelling in the fauces, be seized with a sense of suffocation suddenly, it is a mortal symptom

35 If in a person affected with fever, the neck become suddenly distorted, and he cannot swallow unless with difficulty, although no swelling be present, it is a mortal symptom

36 Sweats, in febrile diseases, are favorable, if they set in on the third, fifth, seventh, ninth, eleventh, fourteenth, seventeenth, twenty-first, twenty-seventh, and thirty-fourth day, for these

sweats prove a crisis to the disease, but sweats not occurring thus, indicate pain, a protracted disease, and relapses

37 Cold sweats occurring along with an acute fever, indicate death, and along with a milder one, a protracted disease

38 And in whatever part of the body there is a sweat, it shows that the disease is seated there

39 And in whatever part of the body heat or cold is seated, there is disease

40 And wherever there are changes in the whole body, and if the body be alternately cold and hot, or if one color succeed another, this indicates a protracted disease

41 A copious sweat after sleep occurring without any manifest cause, indicates that the body is using too much food. But if it occur when one is not taking food, it indicates that evacuation is required

42 A copious sweat, whether hot or cold, flowing continuously, indicates, the cold a greater, and the hot a lesser disease

43 Fevers, not of the intermittent type, which are exacerbated on the third day, are dangerous, but if they intermit in any form, this indicates that they are not dangerous

44 In cases attended with protracted fevers, tubercles (*phymata*) or pains occur about the joints

45. When tubercles (*phymata*) or pains attack the joints after fevers, such persons are using too much food

46 If in a fever not of the intermittent type a rigor seize a person already much debilitated, it is mortal

47 In fevers not of the intermittent type, expectorations which are livid bloody, fetid and bilious, are all bad, but if evacuated properly, they are favorable. So it is with the alvine evacuations and the urine. But if none of the proper excretions take place by these channels, it is bad

48 In fevers not of the intermittent type, if the external parts be cold, but the internal be burnt up, and if there be thirst, it is a mortal symptom

49 In a fever not of the intermittent type, if a lip, an eye-brow, an eye, or the nose, be distorted, or if there be loss of sight or

of hearing, and the patient be in a weak state—whatever of these symptoms occur, death is at hand

50 Apostemes in fevers which are not resolved at the first crisis, indicate a protracted disease

51 When in a fever not of the intermittent type dyspnœa and delirium come on, the case is mortal

52 When persons in fevers, or in other illnesses, shed tears voluntarily, it is nothing out of place, but when they shed tears involuntarily, it is more so

53 In whatever cases of fever very viscid concretions form about the teeth, the fevers turn out to be particularly strong

54 In whatever case of ardent fever dry coughs of a tickling nature with slight expectoration are long protracted, there is usually not much thirst

55 All fevers complicated with buboes are bad, except ephemerals

56 Sweat supervening in a case of fever without the fever ceasing, is bad, for the disease is protracted, and it indicates more copious humors

57 Fever supervening in a case of confirmed spasm, or of tetanus, removes the disease

58 A rigor supervening in a case of ardent fever, produces resolution of it

59 A true tertian comes to a crisis in seven periods at furthest

60 When in fevers there is deafness, if blood run from the nostrils, or the bowels become disordered, it carries off the disease

61 In a febrile complaint, if the fever do not leave on the odd days, it relapses

62 When jaundice supervenes in fevers before the seventh day, it is a bad symptom, unless there be watery discharges from the bowels

63 In whatever cases of fever rigors occur during the day, the fevers come to a resolution during the day

64 When in cases of fever jaundice occurs on the seventh, the ninth, the eleventh, or the fourteenth day, it is a good symp-

tom, provided the hypochondriac region be not hard Otherwise it is not a good symptom

65 A strong heat about the stomach and cardialgia are bad symptoms in fevers

66 In acute fevers, spasms, and strong pains about the bowels are bad symptoms

67 In fevers, frights after sleep, or convulsions, are a bad symptom

68 In fevers, a stoppage of the respiration is a bad symptom, for it indicates convulsions

69 When the urine is thick, grumoss, and scanty in cases not free from fever a copious discharge of thinner urine proves beneficial Such a discharge more commonly takes place when the urine has had a sediment from the first, or soon after the commencement

70 When in fevers the urine is turbid, like that of a beast of burden, in such a case there either is or will be headache

71 In cases which come to a crisis on the seventh day, the urine has a red nubecula on the fourth day, and the other symptoms accordingly

72 When the urine is transparent and white, it is bad, it appears principally in cases of phrenitis

73 When the hypochondriac region is affected with meteorism and borborygmi, should pain of the loins supervene, the bowels get into a loose and watery state, unless there be an eruption of flatus or a copious evacuation of urine These things occur in fevers

74 When there is reason to expect that an abscess will form in joints, the abscess is carried off by a copious discharge of urine, which is thick, and becomes white, like what begins to form in certain cases of quartan fever, attended with a sense of lassitude It is also speedily carried off by a hemorrhage from the nose

75 Blood or pus in the urine indicates ulceration either of the kidneys or of the bladder

76 When small fleshy substances like hairs are discharged along with thick urine, these substances come from the kidneys

77 In those cases where there are furfuraceous particles discharged along with thick urine, there is scabies of the bladder

78 In those cases where there is a spontaneous discharge of bloody urine, it indicates rupture of a small vein in the kidneys

79 In those cases where there is a sandy sediment in the urine, there is calculus in the bladder (or kidneys)

80 If a patient pass blood and clots in his urine, and have strangury, and if a pain seize the hypogastric region and perineum, the parts about the bladder are affected

81 If a patient pass blood, pus, and scales, in the urine, and if it have a heavy smell, ulceration of the bladder is indicated

82 When tubercles form in the urethra, if these suppurate and burst, there is relief

83 When much urine is passed during the night, it indicates that the alvine evacuations are scanty

SECTION V

1 A spasm from taking hellebore is of a fatal nature

2 Spasm supervening on a wound is fatal

3 A convulsion, or hiccup, supervening on a copious discharge of blood is bad

4 A convulsion, or hiccup, supervening upon hypercatharsis is bad

5 If a drunken person suddenly lose his speech, he will die convulsed, unless fever come on, or he recover his speech at the time when the consequences of a debauch pass off

6 Such persons as are seized with tetanus die within four days, or if they pass these they recover

7 Those cases of epilepsy which come on before puberty may undergo a change, but those which come on after twenty-five years of age, for the most part terminate in death

8 In pleuritic affections, when the disease is not purged off in fourteen days, it usually terminates in empyema

9 Phthisis most commonly occurs between the ages of eighteen and thirty-five years

10 Persons who escape an attack of quinsy, and when the

disease is turned upon the lungs, die in seven days, or if they pass these they become affected with empyema

11. In persons affected with phthisis, if the sputa which they cough up have a heavy smell when poured upon coals, and if the hairs of the head fall off, the case will prove fatal

12 Phthisical persons, the hairs of whose head fall off, die if diarrhœa set in

13 In persons who cough up frothy blood, the discharge of it comes from the lungs

14 Diarrhœa attacking a person affected with phthisis is a mortal symptom

15 Persons who become affected with empyema after pleurisy, if they get clear of it in forty days from the breaking of it, escape the disease, but if not, it passes into phthisis

16 Heat produces the following bad effects on those who use it frequently enervation of the fleshy parts, impotence of the nerves, torpor of the understanding, hemorrhages, deliquia, and, along with these, death

17 Cold induces convulsions, tetanus, mortification, and febrile rigors

18 Cold is inimical to the bones, the teeth, the nerves, the brain, and the spinal marrow, but heat is beneficial

19 Such parts as have been congealed should be heated, except where there either is a hemorrhage, or one is expected

20 Cold pinches ulcers, hardens the skin, occasions pain which does not end in suppuration, blackens, produces febrile rigors, convulsions, and tetanus

21 In the case of a muscular youth having tetanus without a wound, during the midst of summer, it sometimes happens that the affusion of a large quantity of cold water recalls the heat Heat relieves these diseases

22 Heat is suppurative, but not in all kinds of sores, but when it is, it furnishes the greatest test of their being free from danger It softens the skin, makes it thin, removes pain, soothes rigor, convulsions, and tetanus It removes affections of the head, and heaviness of it It is particularly efficacious in fractures of the bones, especially of those which have been exposed, and most

especially in wounds of the head, and in mortifications and ulcers from cold, in herpes exedens, of the anus, the privy parts, the womb, the bladder, in all these cases heat is agreeable, and brings matters to a crisis, but cold is prejudicial, and does mischief

23 Cold water is to be applied in the following cases, when there is a hemorrhage, or when it is expected, but not applied *to* the spot, but *around* the spot whence the blood flows, and in inflammations and inflammatory affections, inclining to a red and subsanguineous color, and consisting of fresh blood, in these cases it is to be applied but it occasions mortification in old cases, and in erysipelas not attended with ulceration, as it proves injurious to erysipelas when ulcerated

24 Cold things, such as snow and ice, are inimical to the chest, being provocative of coughs, of discharges of blood, and of catarrhs

25 Swellings and pains in the joints, without ulceration, those of a gouty nature, and sprains, are generally improved by a copious affusion of cold water, which reduces the swelling, and removes the pain, for a moderate degree of numbness removes pain

26 The lightest water is that which is quickly heated and quickly cooled

27 When persons have intense thirst, it is a good thing if they can sleep off the desire of drinking

28 Fumigation with aromatics promotes menstruation, and would be useful in many other cases, if it did not occasion heaviness of the head

29 Women in a state of pregnancy may be purged, if there be any urgent necessity (*or*, if the humors be in a state of orgasm[?]), from the fourth to the seventh month, but less so in the latter case In the first and last periods it must be avoided

30 It proves fatal to a woman in a state of pregnancy, if she be seized with any of the acute diseases

31 If a woman with child be bled, she will have an abortion, and this will be the more likely to happen, the larger the fœtus

32 Hæmoptysis in a woman is removed by an eruption of the menses

33 In a woman when there is a stoppage of the menses, a discharge of blood from the nose is good

34 When a pregnant woman has a violent diarrhœa, there is danger of her miscarrying

35 Sneezing occurring to a woman affected with hysterics, and in difficult labor, is a good symptom

36 When the menstrual discharge is of a bad color and irregular, it indicates that the woman stands in need of purging

37 In a pregnant woman, if the breasts suddenly lose their fullness, she has a miscarriage

38 If, in a woman pregnant with twins, either of her breasts lose its fullness, she will part with one of her children, and if it be the right breast which becomes slender, it will be the male child, or if the left, the female

39 If a woman who is not with child, nor has brought forth, have milk, her menses are obstructed

40 In women, blood collected in the breasts indicates madness

41 If you wish to ascertain if a woman be with child, give her hydromel to drink when she is going to sleep, and has not taken supper, and if she be seized with tormina in the belly, she is with child, but otherwise she is not pregnant

42 A woman with child, if it be a male, has a good color, but if a female, she has a bad color

43 If erysipelas of the womb seize a woman with child, it will probably prove fatal

44 Women who are very lean, have miscarriages when they prove with child, until they get into better condition

45 When women, in a moderate condition of body, miscarry in the second or third month, without any obvious cause, their cotyledones are filled with mucosity, and cannot support the weight of the fœtus, but are broken asunder

46 Such women as are immoderately fat, and do not prove with child, in them it is because the epiploon (*fat?*) blocks up the mouth of the womb, and until it be reduced, they do not conceive

47 If the portion of the uterus seated near the hip-joint suppurate, it gets into a state requiring to be treated with tents

48 The male fœtus is usually seated in the right, and the female in the left side

49 To procure the expulsion of the secundines, apply a sternutatory, and shut the nostrils and mouth

50 If you wish to stop the menses in a woman, apply as large a cupping instrument as possible to the breasts

51 When women are with child, the mouth of their womb is closed

52 If in a woman with child, much milk flow from the breasts, it indicates that the foetus is weak, but if the breasts be firm, it indicates that the foetus is in a more healthy state

53 In women that are about to miscarry, the breasts become slender, but if again they become hard, there will be pain, either in the breasts, or in the hip-joints, or in the eyes, or in the knees, and they will not miscarry

54 When the mouth of the uterus is hard, it is also necessarily shut

55 Women with child who are seized with fevers, and who are greatly emaciated, without any (other?) obvious cause, have difficult and dangerous labors, and if they miscarry, they are in danger

56 In the female flux (*immoderate menstruation?*), if convulsion and deliquium come on, it is bad

57 When the menses are excessive, diseases take place, and when the menses are stopped, diseases from the uterus take place

58 Strangury supervenes upon inflammation of the rectum, and of the womb, and strangury supervenes upon suppuration of the kidney, and hiccup upon inflammation of the liver

59 If a woman do not conceive, and wish to ascertain whether she can conceive, having wrapped her up in blankets, fumigate below, and if it appear that the scent passes through the body to the nostrils and mouth, know that of herself she is not unfruitful

60 If woman with a child have her courses, it is impossible that the child can be healthy

61 If a woman's courses be suppressed, and neither rigor nor fever has followed, but she has been affected with nausea, you may reckon her to be with child

62 Women who have the uterus cold and dense (*compact?*) do not conceive, and those also who have the uterus humid, do not conceive, for the semen is extinguished, and in women whose

uterus is very dry, and very hot, the semen is lost from the want of food, but women whose uterus is in an intermediate state between these temperaments prove fertile

63 And in like manner with respect to males, for either, owing to the laxity of the body, the pneuma is dissipated outwardly, so as not to propel the semen, or, owing to its density, the fluid (*semen*?) does not pass outwardly, or, owing to coldness, it is not heated so as to collect in its proper place (*seminal vessels*?), or, owing to its heat, the very same thing happens

64 It is a bad thing to give milk to persons having headache, and it is also bad to give it in fevers, and to persons whose hypochondria are swelled up, and troubled with borborygm, and to thirsty persons, it is bad also, when given to those who have bilious discharges in acute fevers, and to those who have copious discharges of blood, but it is suitable in phthisical cases, when not attended with very much fever, it is also to be given in fevers of a chronic and weak nature, when none of the aforementioned symptoms are present, and the patients are excessively emaciated

65 When swellings appear on wounds, such cases are not likely to be attacked either with convulsions, or delirium, but when these disappear suddenly, if situated behind, spasms and tetanus supervene, and if before, mania, acute pains of the sides, or suppurations, or dysentery, if the swellings be rather red

66 When no swelling appears on severe and bad wounds, it is a great evil

67 In such cases, the soft are favorable, and crude, unfavorable

68 When a person is pained in the back part of the head, he is benefited by having the straight vein in the forehead opened

69 Rigors commence in women, especially at the loins, and spread by the back to the head, and in men also, rather in the posterior than the anterior side of the body, as from the arms and thighs, the skin there is rare, as is obvious from the growth of hair on them

70 Persons attacked with quartans are not readily attacked with convulsions, or if previously attacked with convulsions, they cease if a quartan supervene

71 In those persons in whom the skin is stretched, and parched and hard, the disease terminates without sweats, but in those in whom the skin is loose and rare, it terminates with sweats

72 Persons disposed to jaundice are not very subject to flatulence

SECTION VI

1 In cases of chronic lientery, acid eructations supervening when there were none previously, is a good symptom

2 Persons whose noses are naturally watery, and their seed watery, have rather a deranged state of health, but those in the opposite state, a more favorable

3 In protracted cases of dysentery, loathing of food is a bad symptom, and still worse, if along with fever

4 Ulcers, attended with a falling off of the hair, are *mali moris*

5 It deserves to be considered whether the pains in the sides, and in the breasts, and in the other parts, differ much from one another

6 Diseases about the kidneys and bladder are cured with difficulty in old men

7 Pains occurring about the stomach, the more superficial they are, the more slight are they, and the less superficial, the more severe

8 In dropsical persons, ulcers forming on the body are not easily healed

9 Broad exanthemata are not very itchy

10 In a person having a painful spot in the head, with intense cephalalgia, pus or water running from the nose, or by the mouth, or at the ears, removes the disease.

11 Hemorrhoids appearing in melancholic and nephritic affections are favorable

12 When a person has been cured of chronic hemorrhoids, unless one be left, there is danger of dropsy or phthisis supervening

13 Sneezing coming on, in the case of a person afflicted with hiccup, removes the hiccup

14 In a case of dropsy, when the water runs by the veins into the belly, it removes the disease

15 In confirmed diarrhœa, vomiting, when it comes on spontaneously, removes the diarrhœa

16 A diarrhœa supervening in a confirmed case of pleurisy or pneumonia is bad

17 It is a good thing in ophthalmy for the patient to be seized with diarrhœa

18 A severe wound of the bladder, of the brain, of the heart, of the diaphragm, of the small intestines, of the stomach, and of the liver, is deadly

19 When a bone, cartilage, nerve, the slender part of the jaw, or prepuce, are cut out, the part is neither restored, nor does it unite

20 If blood be poured out preternaturally into a cavity, it must necessarily become corrupted

21 In maniacal affections, if varices or hemorrhoids come on, they remove the mania

22 Those ruptures in the back which spread down to the elbows are removed by venesection

23 If a fright or despondency lasts for a long time, it is a melancholic affection

24 If any of the small intestines be transfixed, it does not unite

25. It is not a good sign for an erysipelas spreading outwardly to be determined inward, but for it to be determined outward from within is good

26 In whatever cases of ardent fever tremors occur, they are carried off by a delirium

27 Those cases of empyema or dropsy which are treated by incision or the cautery, if the water or pus flow rapidly all at once, certainly prove fatal

28 Eunuchs do not take the gout, nor become bald

29 A woman does not take the gout, unless her menses be stopped

30 A young man does not take the gout until he indulges in coition

31 Pains of the eyes are removed by drinking pure wine, or the bath, or a fomentation, or venesection, or purging

32 Persons whose speech has become impaired are likely to be seized with chronic diarrhœa

33 Persons having acid eructations are not very apt to be seized with pleurisy

34 Persons who have become bald are not subject to large varices, but should varices supervene upon persons who are bald, their hair again grows thick.

35 Hiccup supervening in dropsical cases is bad

36 Venesection cures dysuria, open the internal veins of the arm

37. It is a good symptom when swelling on the outside of the neck seizes a person very ill of quinsy, for the disease is turned outwardly

38 It is better not to apply any treatment in cases of occult cancer, for, if treated, the patients die quickly, but if not treated, they hold out for a long time

39 Convulsions take place either from repletion or depletion, and so it is with hiccup

40 When pains, without inflammation, occur about the hypochondria, in such cases, fever supervening removes the pain

41 When pus formed anywhere in the body does not point, this is owing to the thickness of the part

42 In cases of jaundice, it is a bad symptom when the liver becomes indurated.

43 When persons having large spleens are seized with dysentery, and if the dysentery pass into a chronic state, either dropsy or lentergy supervenes, and they die

44 When ileus comes on in a case of strangury, they prove fatal in seven days, unless, fever supervening, there be a copious discharge of urine.

45 When ulcers continue open for a year or upward, there must necessarily be exfoliation of bone, and the cicatrices are hollow

46 Such persons as become hump-backed from asthma or cough before puberty, die.

47 Persons who are benefited by venesection or purging, should be bled or purged in spring

48 In enlargement of the spleen, it is a good symptom when dysentery comes on

49 In gouty affections, the inflammation subsides in the course of forty days

50 When the brain is severely wounded, fever and vomiting of bile necessarily supervene

51 When persons in good health are suddenly seized with pains in the head, and straightway are laid down speechless, and breathe with stertor, they die in seven days, unless fever come on

52 We must attend to the appearances of the eyes in sleep, as presented from below, for if a portion of the white be seen between the closed eyelids, and if this be not connected with diarrhœa or severe purging, it is a very bad and mortal symptom

53 Delirium attended with laughter is less dangerous than delirium attended with a serious mood

54 In acute diseases, complicated with fever, a moaning respiration is bad

55 For the most part, gouty affections rankle in spring and in autumn

56 In melancholic affections, determinations of the humor which occasions them produce the following diseases. either apoplexy of the whole body, or convulsion, or madness, or blindness

57 Persons are most subject to apoplexy between the ages of forty and sixty

58 If the omentum protrude, it necessarily mortifies and drops off

59 In chronic diseases of the hip-joint, if the bone protrude and return again into its socket, there is mucosity in the place

60 In persons affected with chronic disease of the hip-joint, if the bone protrude from its socket, the limb becomes wasted and maimed, unless the part be cauterized

SECTION VII

1 In acute diseases, coldness of the extremities is bad

2 Livid flesh on a diseased bone is bad

- 3 Hiccup and redness of the eyes, when they supervene on vomiting, are bad
- 4 A chill supervening on a sweat is not good
- 5 Dysentery, or dropsy, or ecstasy coming on madness is good
- 6 In a very protracted disease, loss of appetite and unmixed discharges from the bowels are bad symptoms
- 7 A rigor and delirium from excessive drinking are bad
- 8 From the rupture of an internal abscess, prostration of strength, vomiting, and deliquium animi result
- 9 Delirium or convulsion from a flow of blood is bad
- 10 Vomiting, or hiccup, or convulsion, or delirium, in ileus, is bad
- 11 Pneumonia coming on pleurisy is bad
- 12 Phrenitis along with pneumonia is bad
- 13 Convulsion or tetanus, coming upon severe burning, is bad
- 14 Stupor or delirium from a blow on the head is bad
- 15 From a spitting of blood there is a spitting of pus
- 16 From spitting of pus arise phthisis and a flux, and when the sputa are stopped, they die
- 17 Hiccup in inflammation of the liver is bad
- 18 Convulsion or delirium supervening upon insomnolency is bad
- 18 * Trembling upon lethargus is bad
- 19 Erysipelas upon exposure of a bone (is bad?)
- 20 Mortification or suppuration upon erysipelas is bad
21. Hemorrhage upon a strong pulsation in wounds is bad
- 22 Suppuration upon a protracted pain of the parts about the bowels is bad
- 23 Dysentery upon unmixed alvine discharges is bad
- 24 Delirium upon division of the cranium, if it penetrate into the cavity of the head, is bad
- 25 Convulsion upon severe purging is mortal
- 26 Upon severe pain of the parts about the bowels, coldness of the extremities coming on is bad
- 27 Tenesmus coming on in a case of pregnancy causes abortion
- 28 Whatever piece of bone, cartilage, or nerve (*tendon?*) is cut off, it neither grows nor unites

29 When strong diarrhœa supervenes in a case of leucophlegmatia, it removes the disease

30 In those cases in which frothy discharges occur in diarrhœa there are defluxions from the head

31 When there is a farinaceous sediment in the urine during fever, it indicates a protracted illness

32 In those cases in which the urine is thin at first, and the sediments become bilious, an acute disease is indicated

33 In those cases in which the urine becomes divided there is great disorder in the body

34 When bubbles settle on the surface of the urine, they indicate disease of the kidneys, and that the complaint will be protracted

35 When the scum on the surface is fatty and copious, it indicates acute diseases of the kidneys

36 Whenever the aforementioned symptoms occur in nephritic diseases, and along with them acute pains about the muscles of the back, provided these be seated about the external parts, you may expect that there will be an abscess, but if the pains be rather about the internal parts, you may also rather expect that the abscess will be seated internally

37 Hæmatemesis, without fever, does not prove fatal, but with fever it is bad, it is to be treated with refrigerant and styptic things

38 Defluxions into the cavity of the chest suppurate in twenty days

39 When a patient passes blood and clots, and is seized with strangury and pain in the perineum and pubes, disease about the bladder is indicated

40 If the tongue suddenly lose its powers, or a part of the body become apoplectic, the affection is of a melancholic nature

41 In hypercatharsis, of old persons, hiccup supervening is not a good symptom

42 In a fever, which is not of a bilious nature, a copious affusion of hot water upon the head removes the fever

43 A woman does not become ambidexterous

44 When empyema is treated either by the cautery or incision,

if pure and white pus flow from the wound, the patients recover, but if mixed with blood, slimy and fetid, they die

45 When abscess of the liver is treated by the cautery or incision, if the pus which is discharged be pure and white, the patients recover, (for in this case it is situated in the coats of the liver,) but if it resemble the lees of oil as it flows, they die

46 Pains of the eyes are removed by drinking undiluted wine, plenteous bathing with hot water, and venesection

47 If a dropsical patient be seized with hiccup the case is hopeless

48 Strangury and dysuria are cured by drinking pure wine, and venesection, open the vein on the inside

49 It is a good sign when swelling and redness on the breast seize a person very ill of quinsy, for in this case the disease is diverted outwardly

50 When the brain is attacked with sphacelus, the patients die in three days, or if they escape these, they recover

51 Sneezing arises from the head, owing to the brain being heated, or the cavity (*ventricle*) in the head being filled with humors, the air confined in it then is discharged, and makes a noise, because it comes through a narrow passage

52 Fever supervening on painful affections of the liver removes the pain

53 Those persons to whom it is beneficial to have blood taken from their veins, should have it done in spring

54 In those cases where phlegm is collected between the diaphragm and the stomach, and occasions pain, as not finding a passage into either of the cavities, the disease will be carried off if the phlegm be diverted to the bladder by the veins

55 When the liver is filled with water and bursts into the epiploon, in this case the belly is filled with water and the patient dies

56 Anxiety, yawning, rigor,—wine drunk with an equal proportion of water, removes these complaints

57 When tubercles (*phymata*) form in the urethra, if they suppurate and burst, the pain is carried off

58 In cases of concussion of the brain produced by any cause, the patients necessarily lose their speech

59 In a person affected with fever, when there is no swelling in the fauces, should suffocation suddenly come on, and the patient not be able to swallow, except with difficulty, it is a mortal symptom

59 * In the case of a person oppressed by fever, if the neck be turned aside, and the patient cannot swallow, while there is no swelling in the neck, it is a mortal sign

60 Fasting should be prescribed for those persons who have humid flesh, for fasting dries bodies

61 When there are changes in the whole body, and the body becomes sometimes cold and sometimes hot, and the color changes, a protracted disease is indicated

62 A copious sweat, hot or cold, constantly flowing, indicates a superabundance of humidity, we must evacuate then, in a strong person upward, and in a weak, downward

63 Fevers, not of the intermittent type, if they become exacerbated every third day are dangerous, but if they intermit in any form whatever, this shows that they are not dangerous

64 In cases of protracted fever, either chronic abscesses or pains in the joints come on

65 When chronic abscesses (*phymata*) or pains in the joints take place after fevers, the patients are using too much food

66 If one give to a person in fever the same food which is given to a person in good health, what is strength to the one is disease to the other

67 We must look to the urinary evacuations, whether they resemble those of persons in health, if not at all so, they are particularly morbid, but if they are like those of healthy persons, they are not at all morbid

68 When the dejections are allowed to stand and not shaken, and a sediment is formed like scrapings (of the bowels), in such a case it is proper to purge the bowels, and if you give ptisans before purging, the more you give the more harm you will do.

69 Crude dejections are the product of black bile, if abundant, of more copious, and if deficient, of less copious collections of it

70 The sputa in fevers, not of an intermittent type, which

are livid, streaked with blood, and fetid, are all bad, it is favorable when this evacuation, like the urinary and alvine, passes freely, and whenever any discharge is suppressed and not purged off it is bad

71 When you wish to purge the body, you must bring it into a state favorable to evacuations, and if you wish to dispose it to evacuations upward, you must bind the belly, and if you wish to dispose it to evacuations downward, you must moisten the belly

72 Sleep and watchfulness, both of them, when immoderate, constitute disease

73 In fevers which do not intermit, if the external parts be cold, and the internal burning hot, and fever prevail, it is a mortal sign

74 In a fever which does not intermit, if a lip, the nose, or an eye be distorted, if the patient lose his sense of sight or of hearing, while now in a weak state,—whatever of these symptoms occurs it is mortal

75 Upon leucophlegmatia dropsy supervenes

76 Upon diarrhœa dysentery

77 Upon dysentery lientery

78 Upon sphacelus exfoliation of the bone

79 and 80 Upon vomiting of blood consumption, and a purging of pus upward, upon consumption a defluxion from the head, upon a defluxion diarrhœa, upon diarrhœa a stoppage of the purging upward, upon the stoppage of it death

81 In the discharges by the bladder, the belly, and the flesh (*the skin?*) if the body has departed slightly from its natural condition, the disease is slight, if much, it is great, if very much, it is mortal

82 Persons above forty years of age who are affected with frenzy, do not readily recover, the danger is less when the disease is cognate to the constitution and age

83 In whatever diseases the eyes weep voluntarily, it is a good symptom, but when involuntarily, it is a bad

84 When in quartan fevers blood flows from the nostrils it is a bad symptom

85 Sweats are dangerous when they do not occur on critical

days, when they are strong, and quickly forced out of the forehead, either in the form of drops or in streams, and if excessively cold and copious, for such a sweat must proceed from violence, excess of pain, and prolonged squeezing (*affliction?*)

86 In a chronic disease an excessive flux from the bowels is bad

87 Those diseases which medicines do not cure, iron (*the knife?*) cures, those which iron cannot cure, fire cures, and those which fire cannot cure, are to be reckoned wholly incurable



The Law

MEDICINE is of all the Arts the most noble, but, owing to the ignorance of those who practice it, and of those who, inconsiderately, form a judgment of them, it is at present far behind all the other arts. Their mistake appears to me to arise principally from this, that in the cities there is no punishment connected with the practice of medicine (and with it alone) except disgrace,¹ and that does not hurt those who are familiar with it. Such persons are like the figures which are introduced in tragedies, for as they have the shape, and dress, and personal appearance of an actor, but are not actors, so also physicians are many in title but very few in reality.

2 Whoever is to acquire a competent knowledge of medicine, ought to be possessed of the following advantages: a natural disposition, instruction, a favorable position for the study, early tuition, love of labor, leisure. First of all, a natural talent is required, for, when Nature opposes, everything else is in vain, but when Nature leads the way to what is most excellent, instruction in the art takes place, which the student must try to appropriate to himself by reflection, becoming an early pupil in a place well adapted for instruction. He must also bring to the task a love of labor and perseverance, so that the instruction taking root may bring forth proper and abundant fruits.

3 Instruction in medicine is like the culture of the productions

¹ In this passage it would seem to be asserted, that in the time of the writer there was no punishment of *mala praxis* except the disgrace which it entailed. Many other passages in the Hippocratic treatises would lead to the inference that a more severe responsibility attached to the physician for unfortunate practice, as we often find the practitioner warned not to have anything to do with certain cases. Here the author of this treatise seems to regret the want of a proper medical police.

of the earth For our natural disposition is, as it were, the soil, the tenets of our teacher are, as it were, the seed, instruction in youth is like the planting of the seed in the ground at the proper season, the place where the instruction is communicated is like the food imparted to vegetables by the atmosphere, diligent study is like the cultivation of the fields, and it is time which imparts strength to all things and brings them to maturity

4 Having brought all these requisites to the study of medicine, and having acquired a true knowledge of it, we shall thus, in traveling through the cities, be esteemed physicians not only in name but in reality But inexperience is a bad treasure, and a bad fund to those who possess it, whether in opinion or reality, being devoid of self-reliance and contentedness, and the nurse both of timidity and audacity For timidity betrays a want of powers, and audacity a want of skill There are, indeed, two things, knowledge and opinion, of which the one makes its possessor really to know, the other to be ignorant

5 Those things which are sacred, are to be imparted only to sacred persons, and it is not lawful to impart them to the profane until they have been initiated in the mysteries of the science



On Ulcers

WE MUST avoid wetting all sorts of ulcers except with wine, unless the ulcer be situated in a joint For, the dry is nearer to the sound, and the wet to the unsound, since an ulcer is wet, but a sound part is dry And it is better to leave the part without a bandage unless a cataplasm be applied Neither do certain ulcers admit of cataplasms, and this is the case with the recent rather than the old, and with those situated in joints A spare diet and water agree with all ulcers, and with the more recent rather than the older, and with an ulcer which either is inflamed or is about to be so, and where there is danger of gangrene, and with the ulcers an inflammation in joints, and where there is danger of convulsion, and in wounds of the belly, but most especially in fractures of the head and thigh, or any other member in which a fracture may have occurred In the case of an ulcer, it is not expedient to stand, more especially if the ulcer be situated in the leg, but neither, also, is it proper to sit or walk But quiet and rest are particularly expedient Recent ulcers, both the ulcers themselves and the surrounding parts, will be least exposed to inflammation, if one shall bring them to a suppuration as expeditiously as possible, and if the matter is not prevented from escaping by the mouth of the sore, or, if one should restrain the suppuration, so that only a small and necessary quantity of pus may be formed, and the sore may be kept dry by a medicine which does not create irritation For the part becomes inflamed when rigor and throbbing supervene, for ulcers then get inflamed when suppuration is about to form A sore suppurates when the blood is changed and be-

comes heated, so that becoming putrid, it constitutes the pus of such ulcers. When you seem to require a cataplasm, it is not the ulcer itself to which you must apply the cataplasm, but to the surrounding parts, so that the pus may escape and the hardened parts may become soft. Ulcers formed either from the parts having been cut through by a sharp instrument, or excised, admit of medicaments for bloody wounds (*ἐναιμα*), and which will prevent suppuration by being desiccant to a certain degree. But, when the flesh has been contused and roughly cut by the weapon, it is to be so treated that it may suppurate as quickly as possible, for thus the inflammation is less, and it is necessary that the pieces of flesh which are bruised and cut should melt away by becoming putrid, being converted into pus, and that new flesh should then grow up. In every recent ulcer, except in the belly, it is expedient to cause blood to flow from it abundantly, and as may seem seasonable, for thus will the wound and the adjacent parts be less attacked with inflammation. And, in like manner, from old ulcers, especially if situated in the leg, in a toe or finger, more than in any other part of the body. For when the blood flows they become drier and less in size, as being thus dried up. It is this (*the blood*?) especially which prevents such ulcers from healing, by getting into a state of putrefaction and corruption. But, it is expedient, after the flow of the blood, to bind over the ulcer a thick and soft piece of sponge, rather dry than wet, and to place above the sponge some slender leaves. Oil, and all things of an emollient and oily nature, disagree with such ulcers, unless they are getting nearly well. Neither does oil agree with wounds which have been recently inflicted, nor yet do medicines formed with oil or suet, more especially if the ulcer stands in need of more cleansing. And, in a word, it is in summer and in winter that we are to smear with oil these sores that require such medicines.

2 Gentle purging of the bowels agrees with most ulcers, and in wounds of the head, belly, or joints, where there is danger of gangrene, in such as require sutures, in phagedænic, spreading and in otherwise inveterate ulcers. And when you want to apply a bandage, no plasters are to be used until you have rendered the

sore dry, and then indeed you may apply them The ulcer is to be frequently cleaned with a sponge, and then a dry and clean piece of cloth is to be frequently applied to it, and in this way the medicine which it is supposed will agree with it is to be applied, either with or without a bandage The hot season agrees better than winter with most ulcers, except those situated in the head and belly, but the equinoctial season agrees still better with them Ulcers which have been properly cleansed and dried as they should be, do not usually get into a fungated state When a bone has exfoliated, or has been burned, or sawed, or removed in any other way, the cicatrices of such ulcers become deeper than usual Ulcers which are not cleansed, are not disposed to unite if brought together, nor do the lips thereof approximate of their own accord When the points adjoining to an ulcer are inflamed, the ulcer is not disposed to heal until the inflammation subside, nor when the surrounding parts are blackened by mortification, nor when a varix occasions an overflow of blood in the part, is the ulcer disposed to heal, unless you bring the surrounding parts into a healthy condition

3 Circular ulcers, if somewhat hollow, you must scarify all along their edges, or to the extent of half the circle, according to the natural stature of the man When erysipelas supervenes upon any sore, you must purge the body, in the way most suitable to the ulcer, either upward or downward When swelling arises around an ulcer, and if the ulcer remain free from inflammation, there will be a deposit of matter in process of time And whatever ulcer gets swelled along with inflammation and does not subside as the other parts subside which became inflamed and swelled at the same time, there is a danger that such an ulcer may not unite When from a fall, or in any other way, a part has been torn or bruised, and the parts surrounding the ulcer have become swelled, and, having suppurated, matter flows from the swelling by the ulcer, if in such cases a cataplasm be required, it should not be applied to the sore itself, but to the surrounding parts, so that the pus may have free exit, and the indurated parts may be softened But when the parts are softened as the inflammation ceases, then the parts which are separated are to be

brought toward one another, binding on sponges and applying them, beginning from the sound parts and advancing to the ulcer by degrees. But plenty of leaves are to be bound above the sponge. When the parts are prevented from coming together by a piece of flesh full of humors, it is to be removed. When the ulcer is deep seated in the flesh, it is swelled up, both from the bandaging and the compression. Such an ulcer should be cut up upon a director (*specillum*) if possible, at the proper time, so as to admit a free discharge of the matter, and then the proper treatment is to be applied as may be needed. For the most part, in every hollow ulcer which can be seen into direct without any swelling being present, if there be putrefaction in it, or if the flesh be flabby and putrid, such an ulcer, and the parts which surround it, will be seen to be black and somewhat livid. And of corroding ulcers, those which are phagedænic, spread and corrode most powerfully, and, in this case, the parts surrounding the sore will have a black and sub-livid appearance.

4 Cataplasms for swellings and inflammation in the surrounding parts. Boiled mullein, the raw leaves of the trefoil, and the boiled leaves of the epipetrum, and the poley, and if the ulcer stand in need of cleansing, all these things also cleanse, and likewise the leaves of the fig-tree, and of the olive, and the horehound, all these are to be boiled, and more especially the chaste-tree, and the fig, and the olive, and the leaves of the pomegranate are to be boiled in like manner. These are to be used raw and the leaves of the mallow pounded with wine, and the leaves of rue, and those of the green origany. With all these, linseed is to be boiled up and mixed by pounding it as a very fine powder. When there is danger of erysipelas seizing the ulcers, the leaves of woad are to be pounded and applied raw in a cataplasm along with linseed, or the linseed is to be moistened with the juice of strychnos or of woad, and applied as a cataplasm. When the ulcer is clean, but both it and the surrounding parts are inflamed, lentil is to be boiled in wine and finely triturated, and, being mixed with a little oil, it is to be applied as a cataplasm, and the leaves of the hip-tree are to be boiled in water and pounded in a fine powder and made into a cataplasm, and apply below a thin, clean

piece of cloth wetted in wine and oil, and when you wish to produce contraction, prepare the leaves of the hip-tree like the lentil, and the cress, wine and finely-powdered linseed are to be mixed together And this is proper linseed, and raw chaste-tree, and Melian alum, all these things being macerated in vinegar

5 Having pounded the white unripe grape in a mortar of red bronze, and passed it through the strainer, expose it to the sun during the day, but remove it during the night, that it may not suffer from the dew, rub it constantly during the day, so that it may dry equally, and may contract as much virtue as possible from the bronze let it be exposed to the sun for as great a length of time as till it acquire the thickness of honey, then put it into a bronze pot with the fresh honey and sweet wine, in which turpentine resin has been previously boiled, boil the resin in the wine until it become hard like boiled honey, then take out the resin and pour off the wine there should be the greatest proportion of the juice of unripe grape, next of the wine, and third of the honey and myrrh, either the liquid (*stacte*) or otherwise The finest kind is to be levigated and moistened by having a small quantity of the same wine poured on it, and then the myrrh is to be boiled by itself, stirring it in the wine, and when it appears to have attained the proper degree of thickness, it is to be poured into the juice of the unripe grape, and the finest natron is to be toasted, and gently added to the medicine, along with a smaller quantity of the flowers of copper (*flos æris*) than of the natron When you have mixed these things, boil for not less than three days, on a gentle fire made with fuel of the fig-tree or with coals, lest it catch fire The applications should all be free from moisture, and the sores should not be wetted when this medicine is applied in the form of liniment This medicine is to be used for old ulcers, and also for recent wounds of the glans penis, and ulcers on the head and ears Another medicine for the same ulcers —The dried gall of an ox, the finest honey, white wine, in which the shavings of the lotus have been boiled, frankincense, of myrrh an equal part, of saffron an equal part, the flowers of copper, in like manner of liquids, the greatest proportion of wine, next of honey, and least of the gall Another —Wine, a little cedar honey, of dried things,

the flowers of copper, myrrh, dried pomegranate rind Another —Of the roasted flower of copper half a drachm, of myrrh two half-drachms, of saffron three drachms, of honey a small quantity, to be boiled with wine Another —Of frankincense a drachm, of gall a drachm, of saffron three drachms, let each of these be dried and finely levigated, then, having mixed, triturate in a very strong sun, pouring in the juice of an unripe grape, until it become of a gelatinous consistence, for three days, then let them be allowed to macerate in an austere, dark-colored, fragrant wine, which is gradually poured upon them Another —Boil the roots of the holm-oak in sweet white wine, and when it appears to be properly done, having poured off two parts of the wine, and of the lees of wine as free of water as possible one part, then boil, stirring it, so that it may not be burnt, at a gentle fire, until it appear to have attained the proper consistence Another —The other things are to be the same, but, instead of the wine, use the strongest white vinegar, and dip into it wool as greasy as can be procured, and then, moistening it with the lees of oil, boil, and pour in the juice of the wild fig-tree, and add Melian alum, and natron, and the flowers of copper, both toasted This cleanses the ulcers better than the former, but the other is no less desiccant Another.—Dip the wool in a very little water, and then, having added a third part of wine, boil until it attain the proper consistence By these, recent ulcers are most speedily prevented from getting into a state of suppuration

6 Another —Sprinkle on it dried wakerobin, and add the green bark of the fig-tree, pounding it in the juice do this with or without wine, and along with honey Another —Boiling the shavings of lotus with vinegar (the vinegar should be white), then mix the lees of oil and raw tar-water, and use it as a liniment or wash, and bandage above These things in powder prevent recent wounds from suppurating, or they may be used for cleansing the sore along with vinegar, or for sponging with wine

7 Another —Sprinkle (*on the sore*?) lead finely triturated with the recrement of copper, and sprinkle on it, also, the shavings of lotus, and the scales of copper, and alum, and chalcitis, with copper, both alone, and with the shavings of lotus And other-

wise, when it is wanted to use these in a dry state, do it with the Illyrian spodos trituated with the shavings, and with the shavings alone And the flowers of silver alone, in the finest powder, and birthwort, when scraped and finely pounded, may be sprinkled on the part Another, for bloody sores myrrh, frankincense, galls, verdigris the roasted flower of copper, Egyptian alum roasted, vine flowers, grease of wool, plumbago, each of these things is to be diluted, in equal proportions, with wine like the former And there is another preparation of the same —The strongest vinegar of a white color, honey, Egyptian alum, the finest natron, having toasted these things gently, pour in a little gall, this cleanses fungous ulcers, renders them hollow, and is not pungent Another —The herb with the small leaves, which gets the name of *Parthenium parviflorum*, and is used for removing thymia (*warts*?) from the glans penis, alum, chalcitis, a little crude Melian alum (?), sprinkle a little dried elaterium, and a little dried pomegranate rind in like manner

8 The herb which has got the name of *lagopyrus*, fills up hollow and clean ulcers, (when dried it resembles wheat, it has a small leaf like that of the olive, and more long,) and the leaf of horehound, with oil Another —The internal fatty part, resembling honey, of a fig much dried, of water two parts, of linseed not much toasted and finely levigated, one part Another —Of the dried fig, of the flower of copper levigated a little, and the juice of the fig The preparation from dried fig —The black *chamæleon*, the dried gall of an ox, the other things the same Of the powders —Of the slender cress in a raw state, of horehound, of each equal parts, of the dried fig, two parts, of linseed, two parts, the juice of the fig When you use any of these medicines, apply above it compresses wetted in vinegar, apply a sponge about the compresses and make a little more pressure If the surrounding parts be in an inflamed state, apply to them any medicine which may appear suitable

9 If you wish to use a liquid application, the medicine called *caricum* may be rubbed in, and the bandages may be applied as formerly described upon the same principle The medicine is prepared of the following ingredients —Of black hellebore, of

sandarach, of the flakes of copper, of lead washed, with much sulphur, arsenic, and cantharides. This may be compounded so as may be judged most proper, and it is to be diluted with oil of juniper. When enough has been rubbed in, lay aside the medicine, and apply boiled wakerobin in a soft state, either rubbing it in dry, or moistening it with honey. But if you use the caricum in a dry state, you must abstain from these things, and sprinkle the medicine on the sore. The powder from hellebore and sandarach alone answers. Another liquid medicine.—The herb, the leaf of which resembles the arum (wakerobin) in nature, but is white, downy, of the size of the ivy-leaf. This herb is applied with wine, or the substance which forms upon the branches of the ilex, when pounded with wine, is to be applied. Another.—The juice of the unripe grape, the strongest vinegar, the flower of copper, natron, the juice of the wild fig-tree. Alum, the most finely levigated, is to be put into the juice of the wild grape, and it is to be put into a red bronze mortar and stirred in the sun, and removed when it appears to have attained its proper consistence.

10 These are other powders.—Black hellebore, as finely levigated as possible, is to be sprinkled on the sore while any humidity remains about it, and while it continues to spread. The bandaging is the same as when plasters are used. Another, in like manner.—The driest lumps of salt are to be put into a copper, or earthen pot, of equal size, as much as possible, and not large, and the finest honey, of double the size of the salt, as far as can be guessed, is to be poured upon the lumps of salt, then the vessel is to be put upon coals and allowed to sit there until the whole is consumed. Then, having sponged the ulcer and cleansed it, bandage it as before, and compress it a little more. Next day, wherever the medicine has not been taken in, sprinkle it on, press it down, and bandage. But when you wish to remove the medicine, pour in hot vinegar until it separate, and again do the same things, sponging it away, if necessary. Another corrosive powder.—Of the most finely-levigated misy, sprinkle upon the moist and gangrenous parts, and a little of the flower of copper, not altogether levigated. Another powder equally corrosive.—Having sponged the ulcer, burn the most greasy wool upon a shell

placed on the fire until the whole be consumed, having reduced this to a fine powder, and sprinkled it on the sore, apply the bandage in the same manner. Another powder for the same ulcers.—The black chamæleon, when prepared with the juice of the fig. It is to be prepared roasted, and alkanet mixed with it. Or, pimpernel, and Egyptian alum roasted, and sprinkle on them the Orchomenian powder. For spreading ulcers—Alum, both the Egyptian roasted, and the Melian, but the part is to be first cleansed with roasted natron and sponged, and the species of alum called chalcitis roasted. It is to be roasted until it catch fire.

11 For old ulcers which occur on the fore part of the legs, they become bloody and black.—Having pounded the flower of the melilot and mixed it with honey, use as a plaster. For nerves (*tendons*?) which have been cut asunder.—Having pounded, sifted, and mixed with oil the roots of the wild myrtle, bind on the part, and the herb cinquefoil (it is white and downy, and more raised above the ground than the black cinquefoil), having pounded this herb in oil bind it on the part, and then remove it on the third day.

12 *Emollients* (?)—These medicines are to be used in winter rather than in summer. Emollient medicines which make the cicatrices fair.—Pound the inner mucous part of the squill and pitch, with fresh swine's seam, and a little oil, and a little resin, and ceruse. And the grease of a goose, fresh swine's seam, and squill, and a little oil. The whitest wax, fresh clean grease, or squill and white oil, and a little resin. Wax, swine's seam (old and fresh), and oil, and verdigris, and squill and resin. Let there be two parts of the old grease to the fresh, and of the other things, q s. Having melted the grease that is fresh, pour it into another pot, having levigated plumbago finely and sifted it, and mixed them together, boil and stir at first, boil until when poured upon the ground it concretes, then taking it off the fire, pour it all into another vessel, with the exception of the stony sediment, and add resin and stir, and mix a little oil of juniper, and what has been taken off. In all the emollient medicines to which you add the resin, when you remove the medicine from the fire, pour in and mix the resin while it is still warm. Another.—Old swine's

seam, wax, and oil, the dried shavings of the lotus, frankincense, plumbago,—namely, of the frankincense one part, and of the other one part, and of the shavings of the lotus one part, but let there be two parts of the old grease, one of wax, and of fresh swine's seam one part. Another —Or old swine's seam along with the fresh grease of a goat, when cleaned, let it retain as little as possible of its membrane having triturated or pounded it smooth, pour in oil, and sprinkle the lead with the spodium and half the shavings of the lotus. Another —Swine's seam, spodium, blue chalcitis, oil

13 *For Burns* —You must boil the tender roots of the ilex, and if their bark be very thick and green, it must be cut into small parts, and having poured in white wine, boil upon a gentle fire, until it appear to you to be of the proper consistence, so as to be used for a liniment. And it may be prepared in water after the same manner. Another, not corrosive —Old swine's seam is to be rubbed in by itself, and it is to be melted along with squill, the root of which is to be divided and applied with a bandage. Next day it is to be fomented, and having melted old swine's seam and wax, and mixed with them oil, frankincense, and the shavings of lotus and vermilion, this is to be used as a liniment. Having boiled the leaves of the wakerobin in wine and oil, apply a bandage. Another —When you have smeared the parts with old swine's seam let the roots of asphodel be pounded in wine and triturated, and rubbed in. Another —Having melted old swine's seam, and mixed with resin and bitumen, and having spread it on a piece of cloth and warmed it at the fire, apply a bandage. When an ulcer has formed on the back from stripes or otherwise, let squill, twice boiled, be pounded and spread upon a linen cloth and bound on the place. Afterward the grease of a goat, and fresh swine's seam, spodium, oil, and frankincense are to be rubbed in.

14 Swellings which arise on the feet, either spontaneously or otherwise, when neither the swellings nor the inflammation subside under the use of cataplasms, and although sponges or wool, or anything else be bound upon the sound part, but the swelling and inflammation return of themselves again, an influx of blood

into the veins is the cause, when not occasioned by a bruise And the same story applies if this happen in any other part of the body But blood is to be abstracted, especially from the veins, which are the seat of the influx, if they be conspicuous, but if not, deeper and more numerous scarifications are to be made in the swellings, and whatever part you scarify, this is to be done with the sharpest and most slender instruments of iron When you have removed the blood, you must not press hard upon the part with the specillum, lest you produce contusion Bathe with vinegar, and do not allow a clot of blood to remain between the lips of the wounds, and having spread greasy wool with a medicine for bloody wounds, and having caided the woof and made it soft, bind it on, having wetted it with wine and oil And let the scarified part be so placed that the determination of the blood may be upward and not downward, and do not wet the part at all, and let the patient be put upon a restricted diet and drink water If upon loosing the bandages you find the scarifications inflamed, apply a catasplasm of the fruit of the chaste-tree and linseed But if the scarifications become ulcerated and break into one another, we must be regulated by circumstances, and otherwise apply whatever else appears to be proper

15 When a varix is on the fore part of the leg, and is very superficial, or below the flesh, and the leg is black, and seems to stand in need of having the blood evacuated from it, such swellings are not, by any means, to be cut open, for, generally, large ulcers are the consequence of the incisions, owing to the influx from the varix But the varix itself is to be punctured in many places, as circumstances may indicate

16 When you have opened a vein and abstracted blood, and although the fillet be loosed the bleeding does not stop, the member, whether the arm or leg, is to be put into the reverse position to that from which the blood flows, so that the blood may flow backward, and it is to be allowed to remain in this position for a greater or less space of time Then bind up the part while matters are so, no clots of blood being allowed to remain in the opening Then having applied a double compress, and wetted it with wine, apply above it clean wool which has been smeared with

oil For, although the flow of blood be violent, it will be stopped in this way If a thrombus be formed in the opening, it will inflame and suppurate Venesection is to be practiced when the person has dined more or less freely and drunk, and when somewhat heated, and rather in hot weather than in cold

17 When in cupping, the blood continues to flow after the cupping-instrument has been removed, and if the flow of blood, or serum be copious, the instrument is to be applied again before the part is healed up, so as to abstract what is left behind Otherwise coagula of blood will be retained in the incisions and inflammatory ulcers will arise from them In all such cases the parts are to be bathed with vinegar, after which they are not to be wetted, neither must the person lie upon the scarifications, but they are to be anointed with some of the medicines for bloody wounds When the cupping-instrument is to be applied below the knee, or at the knee, it should be done, if possible, while the man stands erect



On Fistulæ

FISTULÆ are produced by contusions and tubercles, and they are also occasioned by rowing, or riding on horseback, when blood accumulates in the nates near the anus. For, having become putrid, it spreads to the soft parts (the breech being of a humid nature, and the flesh in which it spreads being soft), until the tubercle break and corrupt below at the anus. When this happens, a fistula is formed, having an ichorous discharge, and fæces pass by it, with flatus and much abomination. It is produced, then, by contusions when any of the parts about the anus are bruised by a blow, or a fall, or a wound, or by riding, or rowing, or any such cause. For blood is collected, and it, becoming corrupted, suppurates, and from the suppuration the same accidents happen, as have been described in the case of tubercles.

2 In the first place, then, when you see any such tubercle formed, you must cut it open while still unripe, before it suppurate and burst into the rectum. But if a fistula be already formed when you undertake the case, take a stalk of fresh garlic, and having laid the man on his back, and separated his thighs on both sides, push down the stalk as far as it will go, and thereby measure the depth of the fistula. Then, having bruised the root of seseli to a very fine powder, and poured in some water, let it macerate for four days, and, mixing the water with honey, let the patient drink it, fasting, to the amount of three cyathi, and at the same time purge away the ascarides. Those who are left without treatment die.

3 In the next place, having moistened the strip of cotton cloth,

with the juice of the great tithymallus, and sprinkling on it the flos æris, roasted and triturated, and having made it into a tent equal in length to the fistula, and having passed a thread through the ends of the tent and again through the stalk, and having placed the patient in a reclining position, and having examined the ulcerated parts of the rectum with a speculum, pass the stalk by it, and when it reaches the rectum, take hold of it and draw it out until the tent be pushed through, and be brought on a level above and below. When it (*the tent?*) has been pushed inward, introduce a ball of horn into the rectum (the rectum having been previously smeared with Cimolian chalk), and leave it there, and when the patient wants to go to stool, let it be taken out and again replaced, and let this practice be continued for five days. On the sixth day let it be removed, and drawing the tent out of the flesh, and afterwards pounding alum and filling the ball (*pessary*) and introducing it into the rectum, leave it until the alum melts. Anoint the rectum with myrrh until the parts appear to be united.

4 Another method of cure — Taking a very slender thread of raw lint, and uniting it into five folds of the length of a span, and wrapping them round with a horse hair, then having made a director (*specillum*) of tin, with an eye at its extremity, and having passed through it the end of raw lint wrapped round as above described, introduce the director into the fistula, and, at the same time, introduce the index finger of the left hand *per anum*, and when the director touches the finger, bring it out with the finger, bending the extremity of the director and the end of the threads in it, and the director is to be withdrawn, but the ends of the threads are to be knotted twice or thrice, and the rest of the raw threads is to be twisted around and fastened into a knot. Then the patient is to be told that he may go and attend to his matters. The rest of the treatment — Whenever any part of the thread gets loose owing to the fistula becoming putrid, it is to be tightened and twisted every day, and should the raw thread rot before the fistula is eaten through, you must attach another piece of raw thread to the hair, pass it through, and tie it, for it was for this purpose that the hair was rolled round the raw lint, as it is not

liable to rot When the fistula has sloughed through, a soft sponge is to be cut into very slender pieces and applied, and then the flowers of copper, roasted, are to be frequently applied with a director, and the sponge smeared with honey is to be introduced with the index finger of the left hand, and pushed forward, and another bit of sponge being added, it is to be bound on in the same manner as in the operation for hemorrhoids Next day, having loosed the bandages, the fistula is to be washed with hot water, and cleansed, as far as possible, with the finger of the left hand by means of the sponge, and again the flos æris is to be applied This is to be done for seven days, for generally the coat of the fistula takes that time to slough through The same mode of bandaging is to be persevered in afterwards, until the cure be completed For in this way, the fistula being forcibly expanded by the sponge will not fill up and heal unequally, but it will all become whole together During the treatment, the part should be bathed with plenty of warm water, and the patient kept on a spare diet

5 When the fistula does not get eaten through, having first examined it with a sound, cut down as far as it passes, and sprinkle with the flos æris, and let it remain for five days Then pour warm water upon it, and above lay flour mixed with water, and bind on it the leaves of beet When the flos æris comes away, and the fistulous sore becomes clean, cure it as before described But if the fistula be in a part which does not admit of this treatment, and if it be deep, syringe it with the flowers of copper, and myrrh, and natron, diluted with urine, and introduce a piece of lead into the orifice of the fistula so that it may not close Syringe the fistula by means of a quill attached to a bladder, so that the injection may distend the fistula But it does not heal unless it be cut open

6 If the anus gets inflamed, and there is pain, fever, a frequent desire of going to stool without passing anything, and the anus appears to protrude, owing to the inflammation, and if at times strangury come on, this disease is formed, when phlegm, collected from the whole body, is determined to the rectum Warm things are beneficial in this case, for these, when applied, can attenuate

and dissolve the phlegm, and dilute the acrid and salt particles, so that the heat subsides, and the irritation in the rectum is removed. Wherefore it is to be treated thus —The patient is to be put into a hip-bath of hot water, and sixty grains of the grana gnidia are to be pounded and infused in a hemina of wine, with half a hemina of oil, and injected. This brings away phlegm and fæces. When the patient does not take the hip-bath, boil eggs in dark-colored fragrant wine, and apply to the anus, and spread something warm below, either a bladder filled with warm water, or linseed toasted and ground, and its meal stirred up and mixed equally with dark, fragrant wine, and oil, and thus applied very warm as a cataplasm, or, having mixed barley and Egyptian alum pulverized, form into an oblong ball (*suppository*?) and warming it gently at the fire, make it into a cataplasm, foment, form it into shape with the fingers, and then making it quite tepid, introduce it into the anus. The external parts are to be anointed with cerate, and a cataplasm of boiled garlic, with dark wine diluted, is to be applied. But if you remove these things, let him take the hip-bath of hot water, and having mixed together the juice of srychnos, the grease of a goose, swine's seam, chrysocolia, resin, and white wax, and then having melted in the same and mixed together, anoint with these things, and while the inflammation lasts, use the cataplasm of boiled garlic. And if by these means he be freed from the pain, it is enough, but if not, give him the white meconium (*Euphorbia pepylus*?), or, if not it, any other phlegmagogue medicine. While the inflammation lasts, the diet should be light.

7 The strangury comes on in this way —The bladder being heated from the rectum, phlegm is attracted by the heat, and by the phlegm (*inflammation*?) the strangury is occasioned. If, then, as is frequently the case, it cease with the disease, well, but, if not, give any of the medicines for strangury.

8 If procidentia ani take place, having fomented the part with a soft sponge, and anointed it with a snail, bind the man's hands together, and suspend him for a short time, and the gut will return. But if it still prolapse, and will not remain up, fasten a girdle round his loins and attach a shawl behind, and having

pushed up the anus, apply to it a soft sponge, moistened with hot water in which the shavings of lotus have been boiled, pour of this decoction upon the anus by squeezing the sponge, then, bringing the shawl below between the legs, fasten it at the navel. But if he wish to evacuate the bowels, let him do so upon a very narrow night-stool. Or, if the patient be a child, let him be placed on the feet of a woman, with his back reclined to her knees, and when the bowels are evacuated, let the legs be extended. In this way the anus will be the least disposed to fall out. When a watery and ichorous discharge flows from the rectum, wash it out with burnt lees of wine, and water from myrtle, and having dried maiden-hair, pound and sift it, and apply as a cataplasm. But if there be a discharge of blood, having washed with the same, and pounded chalcitis, and the shavings of cypress, or of juniper, or of stone-pine, or of turpentine, the latter in equal proportions with the chalcitis, apply as a cataplasm. Anoint the external parts with thick cerate.

9 When the gut protrudes and will not remain in its place, scrape the finest and most compact silphium (*assafetida*?) into small pieces and apply as a cataplasm, and apply a sternutatory medicine to the nose and provoke sneezing, and having moistened pomegranate rind with hot water, and having powdered alum in white wine, pour it on the gut, then apply rags, bind the thighs together for three days, and let the patient fast, only he may drink sweet wine. If even thus matters do not proceed properly, having mixed vermilion with honey, anoint.

10 If procidentia ani be attended with a discharge of blood, pare off the rind of the root of wakerobin, then pound and mix flour with it, and apply it warm as a cataplasm. Another — Having scraped off the rind of the most tender roots of the wild vine, which some call *psilothrion*, boil in a dark austere wine undiluted, then having pounded, apply as a tepid cataplasm, but mix also flour and stir it up with white wine and oil in a tepid state. Another — Having pounded the seed of hemlock, pour on it a fragrant white wine, and then apply in a tepid state as a cataplasm.

11 But if it be inflamed, having boiled in water the root of the

ivy, finely powdered, and mixing the finest flour, and stirring it up with white wine, apply as a cataplasm, and mix up some fat with these things Another —Take the root of the mandrake, especially the green (fresh) root, but otherwise the dried, and having cleaned the green root and cut it down, boil in diluted wine, and apply as a cataplasm, but the dry may be pounded and applied as a cataplasm in like manner Another —Having bruised the inner part of a ripe cucumber to a soft state, apply as a cataplasm

12 If there be pain without inflammation, having roasted red natron, and pounded it to a fine powder, and added alum and roasted salts, finely trituated, mix together in equal proportions, then having mixed it up with the best pitch and spread upon a rag, apply, and bind Another —Having pounded the green leaves of capers, put into a bag and bind on the part, and when it appears to burn, take it away and apply it afterward, or, if you have not the leaves of capers, pound the rind of its roots, and having mixed it up with dark-colored wine, bind on the part in the same manner This is a good application also for pains of the spleen Of these poultices, those which are cooling, stop the discharge, those which are emollient and heating, discuss, and those which are attractive, dry up and attenuate This disease is formed when bile and phlegm become seated in the parts When the anus is inflamed, it should be anointed with the ointment, the ingredients of which are resin, oil, wax, plumbago, and suet, these being all melted and applied quite hot as a cataplasm



On Hemorrhoids

THE disease of the hemorrhoids is formed in this way if bile or phlegm be determined to the veins in the rectum, it heats the blood in the veins, and these veins becoming heated attract blood from the nearest veins, and being gorged the inside of the gut swells outwardly, and the heads of the veins are raised up, and being at the same time bruised by the fæces passing out, and injured by the blood collected in them, they squirt out blood, most frequently along with the fæces, but sometimes without fæces. It is to be cured thus

2 In the first place it should be known in what sort of a place they are formed. For cutting, excising, sewing, binding, applying putrefacient means to the anus,—all these appear to be very formidable things, and yet, after all, they are not attended with mischief. I recommend seven or eight small pieces of iron to be prepared, a fathom in size, in thickness like a thick specillum, and bent at the extremity, and a broad piece should be on the extremity, like a small obolus¹. Having on the preceding day first purged the man with medicine, on the day of the operation apply the cautery. Having laid him on his back, and placed a pillow below the breech, force out the anus as much as possible with the fingers, and make the irons red-hot, and burn the pile until it be dried up, and so as that no part may be left behind. And burn so as to leave none of the hemorrhoids unburnt, for

¹ I would direct the attention of my surgical readers to the form of the ancient cautery or burning iron, it resembles a small coin, that is to say, it was a disk. I have often thought that modern practitioners in surgery erred in making their cauteries globular, instead of making them flat disks like the ancient

you should burn them all up You will recognize the hemorrhoids without difficulty, for they project on the inside of the gut like dark-colored grapes, and when the anus is forced out they spurt blood When the cautery is applied the patient's head and hands should be held so that he may not stir, but he himself should cry out, for this will make the rectum project the more When you have performed the burning, boil lentils and tares, finely triturated in water, and apply as a cataplasm for five or six days But on the seventh, cut a soft sponge into a very slender slice, its width should be about six inches square Then a thin smooth piece of cloth, of the same size as the sponge, is to be smeared with honey and applied, and with the index finger of the left hand the middle of the sponge is to be pushed as far up as possible; and afterward wool is to be placed upon the sponge so that it may remain in the anus And having girdled the patient about the loins and fastened a shawl to the girdle, bring up this band from behind between the legs and attach it to the girdle at the navel Then let the medicine which I formerly said is calculated to render the skin thick and strong, be bound on These things should be kept on for not less than twenty days The patient should once a day take a draught from flour or millet, or bran, and drink water When the patient goes to stool the part should be washed with hot water Every third day he should take the bath

3 Another method of cure —Having got the anus to protrude as much as possible, foment with hot water, and then cut off the extremities of the hemorrhoids But this medicine should be prepared beforehand, as an application to the wound —Having put urine into a bronze vessel, sprinkle upon the urine the flower of bronze calcined and finely triturated, then, when it is moistened, shake the vessel and dry in the sun When it becomes dry, let it be scraped down and levigated, and apply with the finger to the part, and having oiled compresses, apply them, and bind a sponge above

4 Another method —There grows upon the bleeding condyloma, a protuberance like the fruit of the mulberry, and if the condyloma be far without, an envelope of flesh is adherent to it

Having placed the man over two round stones upon his knees, examine, for you will find the parts near the anus between the buttocks inflated, and blood proceeding from within. If, then, the condyloma below the cover be of a soft nature, bring it away with the finger, for there is no more difficulty in this than in skinning a sheep, to pass the finger between the hide and the flesh. And this should be accomplished without the patient's knowledge, while he is kept in conversation. When the condyloma is taken off, streaks of blood necessarily flow from the whole of the torn part. It must be speedily washed with a decoction of galls, in a dry wine, and the bleeding vein will disappear along with the condyloma, and its cover will be replaced. The older it is, the more easy the cure.

5 But if the condyloma be higher up, you must examine it with the speculum, and you should take care not to be deceived by the speculum, for when expanded, it renders the condyloma level with the surrounding parts, but when contracted, it shows the tumor right again. It is to be removed by smearing it with black hellebore on the finger. Then, on the third day, wash it out with a dry wine. You need not be surprised that there is no discharge of blood when you remove the condyloma, for neither, if you cut off the hands or legs at the articulations will there be any flow of blood, but if you cut them off above or below the joints, you will find there hollow veins which pour out blood, and you will have difficulty in stopping the bleeding. In the same manner, the bleeding vein in the anus, if you cut it above or below the point of separation of the condyloma, will pour forth blood, but if you take away the condyloma at its junction (*with the natural parts?*) there will be no flow of blood. If matters then be thus put to rights, it will be well, but otherwise burn it, taking care not to touch the place with the iron, but bringing it close so as to dry it up, and apply the flos æris in the urine.

6 Another method of curing hemorrhoids — You must prepare a cautery like the *arundo phragmites*, and an iron that exactly fits is to be adapted to it, then the tube being introduced into the anus, the iron, red hot, is to be passed down it, and frequently drawn out, so that the part may bear the more heat, and no sore

may result from the heating, and the dried veins may heal up. But if you are neither disposed to burn nor excise, having first fomented with plenty of hot water and turned out the anus, levigate myrrh, and having burnt galls and Egyptian alum, in the proportion of one and a half to the other things, and as much of melanteria, these things are all to be used in a dry state. The hemorrhoid will separate under the use of these medicines, like a piece of burnt hide. You are to proceed thus until the whole are removed, and a half part of burnt chalcitis does the same thing. But if you wish to effect the cure by suppositories, take the shell of the cuttle fish, a third part of plumbago, bitumen, alum, a little of the flos æris, galls, a little verdigris, having poured a small quantity of boiled honey on these, and formed an oblong suppository, apply until you remove them.

7 An hemorrhoid in a woman may be thus cured. Having fomented with plenty of hot water, boil in the water certain of the fragrant medicines, add pounded tamarisk, roasted litharge and galls, and pour on them white wine, and oil, and the grease of a goose, pounding all together. Give to use after fomenting. In fomenting the anus is to be made to protrude as much as possible.



On the Sacred Disease

IT IS thus with regard to the disease called Sacred it appears to me to be nowise more divine nor more sacred than other diseases, but has a natural cause from which it originates like other affections. Men regard its nature and cause as divine from ignorance and wonder, because it is not at all like to other diseases. And this notion of its divinity is kept up by their inability to comprehend it, and the simplicity of the mode by which it is cured, for men are freed from it by purifications and incantations. But if it is reckoned divine because it is wonderful, instead of one there are many diseases which would be sacred, for, as I will show, there are others no less wonderful and prodigious, which nobody imagines to be sacred. The quotidian, tertian, and quartan fevers, seem to me no less sacred and divine in their origin than this disease, although they are not reckoned so wonderful. And I see men become mad and demented from no manifest cause, and at the same time doing many things out of place, and I have known many persons in sleep groaning and crying out, some in a state of suffocation, some jumping up and fleeing out of doors, and deprived of their reason until they awaken, and afterward becoming well and rational as before, although they be pale and weak, and this will happen not once but frequently. And there are many and various things of the like kind, which it would be tedious to state particularly. And they who first referred this disease to the gods, appear to me to have been just such persons as the conjurors, purificators, mountebanks, and charlatans now are, who give themselves out for being excessively religious, and as knowing more than other people. Such persons, then, using

the divinity as a pretext and screen of their own inability to afford any assistance, have given out that the disease is sacred, adding suitable reasons for this opinion, they have instituted a mode of treatment which is safe for themselves, namely, by applying purifications and incantations, and enforcing abstinence from baths and many articles of food which are unwholesome to men in diseases. Of sea substances, the sur-mullet, the blacktail, the mullet, and the eel, for these are the fishes most to be guarded against. And of flesh, those of the goat, the stag, the sow, and the dog for these are the kinds of flesh which are aptest to disorder the bowels. Of fowls, the cock, the turtle, and the bustard, and such others as are reckoned to be particularly strong. And of potherbs, mint, garlic, and onions, for what is acrid does not agree with a weak person. And they forbid to have a black robe, because black is expressive of death, and to sleep on a goat's skin, or to wear it, and to put one foot upon another, or one hand upon another, for all these things are held to be hinderances to the cure. All these they enjoin with reference to its divinity, as if possessed of more knowledge, and announcing beforehand other pretents, so that if the person should recover, theirs would be the honor and credit, and if he should die, they would have a certain defense, as if the gods, and not they, were to blame, seeing they had administered nothing either to eat or drink as medicines, nor had overheated him with baths, so as to prove the cause of what had happened. But I am of opinion that (if this were true) none of the Libyans, who live in the interior, would be free from this disease, since they all sleep on goats' skins, and live upon goats' flesh, neither have they couch, robe, nor shoe that is not made of goat's skin, for they have no other herds but goats and oxen. But if these things, when administered in food, aggravate the disease, and if it be cured by abstinence from them, then is God not the cause at all, nor will purifications be of any avail, but it is the food which is beneficial and prejudicial, and the influence of the divinity vanishes. Thus, then, they who attempt to cure these diseases in this way, appear to me neither to reckon them sacred nor divine. For when they are removed by such purifications, and this method of cure, what is to prevent them

from being brought upon men and induced by other devices similar to these¹ So that the cause is no longer divine, but human For whoever is able, by purifications and conjurations, to drive away such an affection, will be able, by other practices, to excite it, and, according to this view, its divine nature is entirely done away with By such sayings and doings, they profess to be possessed of superior knowledge, and deceive mankind by enjoining lustrations and purifications upon them, while their discourse turns upon the divinity and the godhead And yet it would appear to me that their discourse savors not of piety, as they suppose, but rather of impiety, and as if there were no gods, and that what they hold to be holy and divine, were impious and unholy This I will now explain For, if they profess to know how to bring down the moon, and darken the sun, and induce storms and fine weather, and rains and droughts, and make the sea and land unproductive, and so forth, whether they arrogate this power as being derived from mysteries or any other knowledge or consideration, they appear to me to practice impiety, and either to fancy that there are no gods, or, if there are, that they have no ability to ward off any of the greatest evils How, then, are they not enemies to the gods² For if a man by magical arts and sacrifices will bring down the moon, and darken the sun, and induce storms, or fine weather, I should not believe that there was anything divine, but human, in these things, provided the power of the divine were overpowered by human knowledge and subjected to it But perhaps it will be said, these things are not so, but, men being in want of the means of life, invent many and various things, and devise many contrivances for all other things, and for this disease, in every phase of the disease, assigning the cause to a god Nor do they remember the same things once, but frequently For, if they imitate a goat, or grind their teeth, or if their right side be convulsed, they say that the mother of the gods is the cause But if they speak in a sharper and more intense tone, they resemble this state to a horse, and say that Posidon (*Neptune*) is the cause Or if any excrement be passed, which is often the case, owing to the violence of the disease, the appellation of Enodius (*Hecate*²) is adhibited,

or, if it be passed in smaller and denser masses, like bird's, it is said to be from Apollo Nomius. But if foam be emitted by the mouth, and the patient kick with his feet, Ares (*Mars*) gets the blame. But terrors which happen during the night, and fevers, and delirium, and jumpings out of bed, and frightful apparitions, and fleeing away,—all these they hold to be the plots of Hecate, and the invasions of the Heroes, and use purifications and incantations, and, as appears to me, make the divinity to be most wicked and most impious. For they purify those laboring under this disease, with the same sorts of blood and the other means that are used in the case of those who are stained with crimes, and of malefactors, or who have been enchanted by men, or who have done any wicked act, who ought to do the very reverse, namely, sacrifice and pray, and, bringing gifts to the temples, supplicate the gods. But now they do none of these things, but purify, and some of the purifications they conceal in the earth, and some they throw into the sea, and some they carry to the mountains where no one can touch or tread upon them. But these they ought to take to the temples and present to the god, if a god be the cause of the disease. Neither truly do I count it a worthy opinion to hold that the body of man is polluted by god, the most impure by the most holy, for were it defiled, or did it suffer from any other thing, it would be like to be purified and sanctified rather than polluted by god. For it is the divinity which purifies and sanctifies the greatest of offenses and the most wicked, and which proves our protection from them. And we mark out the boundaries of the temples and the groves of the gods, so that no one may pass them unless he be pure, and when we enter them we are sprinkled with holy water, not as being polluted, but as laying aside any other pollution which we formerly had. And thus it appears to me to hold, with regard to purifications. But this disease seems to me to be nowise more divine than others, but it has its nature such as other diseases have, and a cause whence it originates, and its nature and cause are divine only just as much as all others are, and it is curable no less than the others, unless when, from length of time, it is confirmed, and has become stronger than the remedies applied. Its origin is hereditary,

like that of other diseases For if a phlegmatic person be born of a phlegmatic, and a bilious of a bilious, and a phthisical of a phthisical, and one having spleen disease, of another having disease of the spleen, what is to hinder it from happening that where the father and mother were subject to this disease, certain of their offspring should be so affected also? As the semen comes from all parts of the body, healthy particles will come from healthy parts, and unhealthy from unhealthy parts And another great proof that it is in nothing more divine than other diseases is, that it occurs in those who are of a phlegmatic constitution, but does not attack the bilious Yet, if it were more divine than the others, this disease ought to befall all alike, and make no distinction between the bilious and phlegmatic But in them, the brain is the cause of this affection, as it is of other very great diseases, and in what manner and from what cause it is formed, I will now plainly declare The brain of man, as in all other animals, is double, and a thin membrane (*meninx*) divides it through the middle, and therefore the pain is not always in the same part of the head, for sometimes it is situated on either side, and sometimes the whole is affected, and veins run toward it from all parts of the body, many of which are small, but two are thick,—the one from the liver, and the other from the spleen And it is thus with regard to the one from the liver a portion of it runs downward through the parts on the right side, near the kidneys and the psoas muscles, to the inner part of the thigh, and extends to the foot It is called vena cava The other runs upward by the right veins and the lungs, and divides into branches for the heart and the right arm The remaining part of it rises upward across the clavicle to the right side of the neck, and is superficial so as to be seen, near the ear it is concealed, and there it divides, its thickest, largest, and most hollow part ends in the brain, another small vein goes to the right ear, another to the right eye, and another to the nostril Such are the distributions of the hepatic vein And a vein from the spleen is distributed on the left side, upward and downward, like that from the liver, but more slender and feeble By these veins we draw in much spirit (*gas*?) for they are the spiracles of our bodies inhaling air to

themselves and distributing it to the rest of the body, and to the smaller veins, and they cool and afterwards exhale it. For the breath (*pneuma*) cannot be stationary, but it passes upward and downward, for if stopped and intercepted, the part where it is stopped becomes powerless. In proof of this, when, in sitting or lying, the small veins are compressed, so that the breath (*pneuma*) from the larger vein does not pass into them, the part is immediately seized with numbness, and it is so likewise with regard to the other veins. This disease, then, affects phlegmatic persons, but not bilious. It begins to be formed while the fœtus is still *in utero*. For the brain, like the other organs, is depurated and grows before birth. If, then, in this purgation it be properly and moderately depurated, and neither more nor less than what is proper be secreted from it, the head is thus in the most healthy condition. If the secretion (melting) from the whole brain be greater than natural, the person, when he grows up, will have his head diseased, and full of noises, and will neither be able to endure the sun nor cold. Or, if the melting take place from any one part, either from the eye or ear, or if a vein has become slender, that part will be deranged in proportion to the melting. Or, if the depuration do not take place, but it (*the secretion*?) accumulates in the brain, it necessarily becomes phlegmatic. And such children as have an eruption of ulcers on the head, on the ears, and along the rest of the body, with copious discharges of saliva and mucus,—these, in after life, enjoy best health, for in this way the phlegm which ought to have been purged off in the womb, is discharged and cleared away, and persons so purged, for the most part, are not subject to attacks of this disease. But such as have had their skin free from eruptions, and have had no discharge of saliva or mucus, nor have undergone the proper purgation in the womb, these persons run the risk of being seized with this disease. But if the defluxion be determined to the heart, the person is seized with palpitation and asthma, the chest becomes diseased, and some also have curvature of the spine. For when a defluxion of cold phlegm takes place on the lungs and heart, the blood is chilled, and the veins, being violently chilled, palpitate in the lungs and heart, and the heart palpitates, so that

from this necessity asthma and orthopnœa supervene. For it does not receive the spirits (*pneuma*) until the defluxion of phlegm be mastered, and being heated is distributed to the veins, then it ceases from its palpitation and difficulty of breathing, and this takes place as soon as it obtains an abundant supply, and this will be more slowly, provided the defluxion be more abundant, or if it be less, more quickly. And if the defluxions be more condensed, the epileptic attacks will be more frequent, but otherwise if it be rarer. Such are the symptoms when the defluxion is upon the lungs and heart, but if it be upon the bowels, the person is attacked with diarrhœa. And if, being shut out from all these outlets, its defluxion be determined to the veins I have formerly mentioned, the patient loses his speech, and chokes, and foam issues by the mouth, the teeth are fixed, the hands are contracted, the eyes distorted, he becomes insensible, and in some cases the bowels are evacuated. And these symptoms occur sometimes on the left side, sometimes on the right, and sometimes in both. The cause of every one of these symptoms I will now explain. The man becomes speechless when the phlegm, suddenly descending into the veins, shuts out the air, and does not admit it either to the brain or to the vena cava, or to the ventricles, but interrupts the inspiration. For when a person draws in air by the mouth and nostrils, the breath (*pneuma*) goes first to the brain, then the greater part of it to the internal cavity, and part to the lungs, and part to the veins, and from them it is distributed to the other parts of the body along the veins, and whatever passes to the stomach cools, and does nothing more, and so also with regard to the lungs. But the air which enters the veins is of use (to the body) by entering the brain and its ventricles, and thus it imparts sensibility and motion to all the members, so that when the veins are excluded from the air by the phlegm and do not receive it, the man loses his speech and intellect, and the hands become powerless, and are contracted, the blood stopping and not being diffused, as it was wont, and the eyes are distorted owing to the veins being excluded from the air, and they palpitate, and froth from the lungs issues by the mouth. For when the breath (*pneuma*) does not find

entrance to him, he foams and sputters like a dying person. And the bowels are evacuated in consequence of the violent suffocation, and the suffocation is produced when the liver and stomach ascend to the diaphragm, and the mouth of the stomach is shut up, this takes place when the breath (*pneuma*) does not enter by the mouth, as it is wont. The patient kicks with his feet when the air is shut up in the lungs and cannot find an outlet, owing to the phlegm, and rushing by the blood upward and downward, it occasions convulsions and pain, and therefore he kicks with his feet. All these symptoms he endures when the cold phlegm passes into the warm blood, for it congeals and stops the blood. And if the defluxion be copious and thick, it immediately proves fatal to him, for by its cold it prevails over the blood and congeals it, or, if it be less, it in the first place obtains the mastery, and stops the respiration, and then in the course of time, when it is diffused along the veins and mixed with much warm blood, it is thus overpowered, the veins receive the air, and the patient recovers his senses. And of little children which are seized with this disease, the greater part die, provided the defluxion be copious and humid, for the veins being slender cannot admit the phlegm, owing to its thickness and abundance, but the blood is cooled and congealed, and the child immediately dies. But if the phlegm be in small quantity, and make a defluxion into both the veins, or to those on either side, the children survive, but exhibit notable marks of the disorder, for either the mouth is drawn aside, or an eye, the neck, or a hand, wherever a vein being filled with phlegm loses its tone, and is attenuated, and the part of the body connected with this vein is necessarily rendered weaker and defective. But for the most it affords relief for a longer interval, for the child is no longer seized with these attacks, if once it has contracted this impress of the disease, in consequence of which the other veins are necessarily affected, and to a certain degree attenuated, so as just to admit the air, but no longer to permit the influx of phlegm. However, the parts are proportionally enfeebled whenever the veins are in an unhealthy state. When in striplings the defluxion is small and to the right side, they recover without leaving any marks of the disease, but there

is danger of its becoming habitual, and even increasing if not treated by suitable remedies. Thus, or very nearly so, is the case when it attacks children. But when it attacks persons of a more advanced age, it neither proves fatal, nor produces distortions. For their veins are hollow (*large*²), and filled with hot blood, and therefore the phlegm can neither prevail nor cool the blood, so as to coagulate it, but it is quickly overpowered and mixed with the blood, and thus the veins receive the air, and sensibility remains, and, owing to their strength, the aforesaid symptoms are less likely to seize them. But when this disease attacks very old people, it therefore proves fatal, or induces paraplegia, because the veins are empty, and the blood scanty, thin, and watery. When, therefore, the defluxion is copious, and the season winter, it proves fatal, for it chokes up the exhalents, and coagulates the blood if the defluxion be to both sides, but if to either, it merely induces paraplegia. For the blood being thin, cold, and scanty, cannot prevail over the phlegm, but being itself overpowered, it is coagulated, so that those parts in which the blood is corrupted, lose their strength. The defluxion takes place rather on the right side than on the left, because the veins there are more capacious and numerous than on the left side, for on the one side they spring from the liver, and on the other from the spleen. The defluxion and melting down take place most especially in the case of children in whom the head is heated either by the sun or by fire, or if the brain suddenly contract a rigor, and then the phlegm is excreted. For it is melted down by the heat and diffusion of the brain, but it is excreted by the congealing and contracting of it, and thus a defluxion takes place. And in some this is the cause of the disease, and in others, when the south wind quickly succeeds to northern breezes, it suddenly unbinds and relaxes the brain, which is contracted and weak, so that there is an inundation of phlegm, and thus the defluxion takes place. The defluxion also takes place in consequence of fear, from any hidden cause, if we are frightened at any person's calling aloud, or while crying, when one cannot quickly recover one's breath, such as often happens to children. When any of these things occur, the body immediately shivers,

the person becoming speechless cannot draw his breath, but the breath (*pneuma*) stops, the brain is contracted, the blood stands still, and thus the excretion and defluxion of the phlegm take place. In children, these are the causes of the attack at first. But to old persons winter is most inimical. For when the head and brain have been heated at a great fire, and then the person is brought into cold and has a rigor, or when from cold he comes into warmth, and sits at the fire, he is apt to suffer in the same way, and thus he is seized in the manner described above. And there is much danger of the same thing occurring, if in spring his head be exposed to the sun, but less so in summer, as the changes are not sudden. When a person has passed the twentieth year of his life, this disease is not apt to seize him, unless it has become habitual from childhood, or at least this is rarely or never the case. For the veins are filled with blood, and the brain consistent and firm, so that it does not run down into the veins, or if it do, it does not overpower the blood, which is copious and hot. But when it has gained strength from one's childhood, and become habitual, such a person usually suffers attacks, and is seized with them in changes of the winds, especially in south winds, and it is difficult of removal. For the brain becomes more humid than natural, and is inundated with phlegm, so that the defluxions become more frequent, and the phlegm can no longer be excreted, nor the brain be dried up, but it becomes wet and humid. This you may ascertain in particular, from beasts of the flock which are seized with this disease, and more especially goats, for they are most frequently attacked with it. If you will cut open the head, you will find the brain humid, full of sweat, and having a bad smell. And in this way truly you may see that it is not god that injures the body, but disease. And so it is with man. For when the disease has prevailed for a length of time, it is no longer curable, as the brain is corroded by the phlegm, and melted, and what is melted down becomes water, and surrounds the brain externally, and overflows it, wherefore they are more frequently and readily seized with the disease. And therefore the disease is protracted, because the influx is thin, owing to its quantity, and is immediately overpowered by the blood and heated all

through But such persons as are habituated to the disease, know beforehand when they are about to be seized and flee from men, if their own house be at hand, they run home, but if not, to a deserted place, where as few persons as possible will see them falling, and they immediately cover themselves up This they do from shame of the affection, and not from fear of the divinity, as many suppose And little children at first fall down wherever they may happen to be, from inexperience But when they have been often seized, and feel its approach beforehand, they flee to their mothers, or to any other person they are acquainted with, from terror and dread of the affection, for being still infants they do not know yet what it is to be ashamed And for these reasons, I say, they are attacked during changes of the winds, and especially south winds, then also with north winds, and afterwards also with the others These are the strongest winds, and the most opposed to one another, both as to direction and power For, the north wind condenses the air, and separates from it whatever is muddy and nebulous, and renders it clearer and brighter, and so in like manner also, all the winds which arise from the sea and other waters, for they extract the humidity and nebulosity from all objects, and from men themselves, and therefore it (the north wind) is the most wholesome of the winds But the effects of the south are the very reverse For in the first place it begins by melting and diffusing the condensed air, and therefore it does not blow strong at first, but is gentle at the commencement, because it is not able at once to overcome the dense and compacted air, which yet in a while it dissolves It produces the same effects upon the land, the sea, the rivers, the fountains, the wells, and on every production which contains humidity, and this, there is in all things, some more, some less For all these feel the effects of this wind, and from clear they become cloudy, from cold, hot, from dry, moist, and whatever earthen vessels are placed upon the ground, filled with wine or any other fluid, are affected with the south wind, and undergo a change And the sun, the moon, and the stars it renders blunter in appearance than they naturally are When, then, it possesses such powers over things so great and strong, and the

body is made to feel and undergo changes in the changes of the winds, it necessarily follows that the brain should be dissolved and overpowered with moisture, and that the veins should become more relaxed by the south winds, and that by the north the healthiest portion of the brain should become contracted, while the most morbid and humid is secreted, and overflows externally, and that catarrhs should thus take place in the changes of these winds. Thus is this disease formed and prevails from those things which enter into and go out of the body, and it is not more difficult to understand or to cure than the others, neither is it more divine than other diseases. And men ought to know that from nothing else but thence (*from the brain*) come joys, delights, laughter and sports, and sorrows, griefs, despondency, and lamentations. And by this, in an especial manner, we acquire wisdom and knowledge, and see and hear, and know what are foul and what are fair, what are bad and what are good, what are sweet, and what unsavory, some we discriminate by habit, and some we perceive by their utility. By this we distinguish objects of relish and disrelish, according to the seasons, and the same things do not always please us. And by the same organ we become mad and delirious, and fears and terrors assail us, some by night, and some by day, and dreams and untimely wanderings, and cares that are not suitable, and ignorance of present circumstances, desuetude, and unskilfulness. All these things we endure from the brain, when it is not healthy, but is more hot, more cold, more moist, or more dry than natural, or when it suffers any other preternatural and unusual affection. And we become mad from humidity (*of the brain*). For when it is more moist than natural, it is necessarily put into motion, and the affection being moved, neither the sight nor hearing can be at rest, and the tongue speaks in accordance with the sight and hearing. As long as the brain is at rest, the man enjoys his reason, but the depravement of the brain arises from phlegm and bile, either of which you may recognize in this manner. Those who are mad from phlegm are quiet, and do not cry out nor make a noise, but those from bile are vociferous, malignant, and will not be quiet, but are always doing something improper. If the

madness be constant, these are the causes thereof But if terrors and fears assail, they are connected with derangement of the brain, and derangement is owing to its being heated And it is heated by bile when it is determined to the brain along the blood-vessels running from the trunk, and fear is present until it returns again to the veins and trunk, when it ceases He is grieved and troubled when the brain is unseasonably cooled and contracted beyond its wont This it suffers from phlegm, and from the same affection the patient becomes oblivious He calls out and screams at night when the brain is suddenly heated The bilious endure this But the phlegmatic are not heated, except when much blood goes to the brain, and creates an ebullition Much blood passes along the aforesaid veins But when the man happens to see a frightful dream and is in fear as if awake, then his face is in a greater glow, and the eyes are red when the patient is in fear And the understanding meditates doing some mischief, and thus it is affected in sleep But if, when awakened, he returns to himself, and the blood is again distributed along the aforesaid veins, it ceases In these ways I am of opinion that the brain exercises the greatest power in the man This is the interpreter to us of those things which emanate from the air, when it (*the brain*) happens to be in a sound state But the air supplies sense to it And the eyes, the ears, the tongue and the feet, administer such things as the brain cogitates For inasmuch as it is supplied with air, does it impart sense to the body It is the brain which is the messenger to the understanding For when the man draws the breath (*pneuma*) into himself, it passes first to the brain, and thus the air is distributed to the rest of the body, leaving in the brain its acme, and whatever has sense and understanding For if it passed first to the body and last to the brain, then having left in the flesh and veins the judgment, when it reached the brain it would be hot, and not at all pure, but mixed with the humidity from the fleshy parts and the blood, so as to be no longer pure Wherefore, I say, that it is the brain which interprets the understanding But the diaphragm has obtained its name (*φρένες*) from accident and usage, and not from reality or nature, for I know no power which it possesses, either as to

sense or understanding, except that when the man is affected with unexpected joy or sorrow, it throbs and produces palpitations, owing to its thinness, and as having no belly to receive anything good or bad that may present themselves to it, but it is thrown into commotion by both these, from its natural weakness. It then perceives beforehand none of those things which occur in the body, but has received its name vaguely and without any proper reason, like the parts about the heart, which are called auricles, but which contribute nothing towards hearing. Some say that we think with the heart, and that this is the part which is grieved, and experiences care. But it is not so, only it contracts like the diaphragm, and still more so for the same causes. For veins from all parts of the body run to it, and it has valves, so as to perceive if any pain or pleasurable emotion befall the man. For when grieved the body necessarily shudders, and is contracted, and from excessive joy it is affected in like manner. Wherefore the heart and the diaphragm are particularly sensitive, they have nothing to do, however, with the operations of the understanding, but of all these the brain is the cause. Since, then, the brain, as being the primary seat of sense and of the spirits, perceives whatever occurs in the body, if any change more powerful than usual take place in the air, owing to the seasons, the brain becomes changed by the state of the air. For, on this account, the brain first perceives, because, I say, all the most acute, most powerful, and most deadly diseases, and those which are most difficult to be understood by the inexperienced, fall upon the brain. And the disease called the Sacred arises from causes as the others, namely, those things which enter and quit the body, such as cold, the sun, and the winds, which are ever changing and are never at rest. And these things are divine, so that there is no necessity for making a distinction, and holding this disease to be more divine than the others, but all are divine, and all human. And each has its own peculiar nature and power, and none is of an ambiguous nature, or irremediable. And the most of them are curable by the same means as those by which they were produced. For any other thing is food to one, and injurious to another. Thus, then, the physician should under-

stand and distinguish the season of each, so that at one time he may attend to the nourishment and increase, and at another to abstraction and diminution. And in this disease as in all others, he must strive not to feed the disease, but endeavor to wear it out by administering whatever is most opposed to each disease, and not that which favors and is allied to it. For by that which is allied to it, it gains vigor and increase, but it wears out and disappears under the use of that which is opposed to it. But whoever is acquainted with such a change in men, and can render a man humid and dry, hot and cold by regimen, could also cure this disease, if he recognizes the proper season for administering his remedies, without minding purifications, spells, and all other illiberal practices of a like kind.

EXPLANATION OF THE PLATES

PLATE I

- FIG 1 The Saw used by carpenters (Taken from *Chirurgia è Græco in Latinum conversa, Vido Vido interprete Lutetiæ Parisiorum*, p 115)
2. A small Saw (*Ibid*)
 - 3 The Modiolus, or ancient Trephine (*Ibid*)
 - 4 The Terebra, or Trepan, called Abaptiston. (*Ibid* p 116)
 - 5 The Auger used by carpenters (*Ibid* p 116)
 - 6 The Terebra, or Trepan, which is turned round by a thong bound tight about its middle (*Ibid* p 117)
 - 7 The Auger, or Trepan, which is turned round by a bow (*Ibid* p 118)
 - 8 A Terebra, or Trepan, which is turned round by a thong on a cross-beam (*Ibid* p 119)
 - 9 A Terebra, or Trepan, which has a ball in its upper end, by which it is turned round (*Ibid* p 120)
 - 10 A Terebra, or Trepan, which is turned round by a cross piece of wood, or handle, on its upper end (*Ibid* p 120)

PLATE II

- FIG 1 A Terebra, or Trepan, turned round by a handle in its middle (*Ibid* p 122.) It resembles the centre-bit of modern artisans
- 1 A hole into which the iron head is fixed
 2. Upright part, three inches long
 - 3 Cross part, one inch long
 - 4 The part which is grasped in turning the instrument
 5. Cross part, an inch long
 6. Upright part
 - 7 A ball fixed to the top
- A B C Different forms of the iron head fixed in the hole 1

- FIG 2 Scalper rectus, *or* straight Raspatory (*Ibid* p 123)
 3 Scalper in medio recurvatus, *or* bent Raspatory (*Ibid* p 123)
 4, 5, 6 Ancient Modioli, as represented by Pott (*Injuries of the Head*, p 153)

PLATE III

- FIG 1 and 2 A Scalper, *or* Raspatory, with which the moderns scrape the bone (*Chirurgia è Græco, &c*, p 125)
 3 Scalper cavus *or* scooped Raspatory (*Ibid* p 126)
 4 A Lenticular (*Ibid* p 127)
 5 A Malleolus, *or* Mallet (*Ibid* p 126)
 6 A Lever, by which modern surgeons protect the dura mater, and raise a depressed bone (*Ibid* p 128)
 7 The ancient Meningophylax (*Ibid* p 128)
 8 Forfex excisoria, *or* Cutting Scissors (*Ibid* p 129)
 9 A Forceps, used for extracting bones (*Ibid* p 130)

PLATE IV

- FIG 1 The Scamnum Hippocratis, *or* Bench of Hippocrates, as represented by Andreas a Cruce (*Officina Chirurgica Venetus*, 1596)
 2. The same, as represented by M Littré
 A A board, 6 cubits long, 2 broad, and 12 inches thick, not 13, as incorrectly stated by M Littré
 B The feet of the Axles, which are short
 CC Axle-trees
 DD. Grooves three inches deep, three broad, separated from one another by four inches
 E A small post, *or* pillar, fastened in the middle of the machine in a quadrangular hole
 F Pillars a foot long
 G A cross-beam laid on the pillars FF, which can be placed at different heights by means of holes in the pillars

PLATE V

FIG 1 Representation of the mode of reducing dislocation of the thigh outwards, as given by M Littré (*Œuv d'Hipp*, tom iv, p 305)

A mistake in the figure given by M Littré is here corrected
It applies to Articulations, §74

A. A lever applied to the nates of the luxated side, and acting from without inwards, in order to bring the head of the bone into its cavity

B Another lever, held by an assistant, put into one of the grooves of the machine, and intended to act against lever A

C Groove in which the end of the lever A takes its point of support

D The luxated member

EE Extension and counter-extension.

2 Representation of the ancient mode of performing succussion, as given by Vidus Vidius in the Venetian edition of Galen's works (Cl vi, p 271)

It applies to Articulations, §43

PLATE VI

FIG 1 The Circular Band, named *Rotunda sincera æqualis*.
From the Venetian edition of Galen (vi, p 205)

2 and 3 The form of bandage named *Ascia sincera in-æqualis* (*Ibid* p 206)

4 and 5 The form of bandage named *Sima sincera in-æqualis* (*Ibid*)

These bandages relate to the work, On the Surgery

PLATE VII

FIG 1 The bandage named *Monoculus*.

2 The bandage named *Rhombus*

3 The bandage named *Semirhombus*

These figures apply to the work, On the Surgery

PLATE VIII

- FIG 1. Elastic rods used as splints in fracture of the leg Fig-
ure as given by Littre (*Œuv d'Hippocrat*, iii, p 519)
2 The same, as given by Vidus Vidius in the Venetian
edition of Galen

These two figures apply to the description given in §30 of
Fractures

- 3 and 4 Apparatus for the cure of Club-foot, as given by
Aracæus The Boot, probably, was used in lieu of
the Chian sandals of Hippocrates

PLATE I.

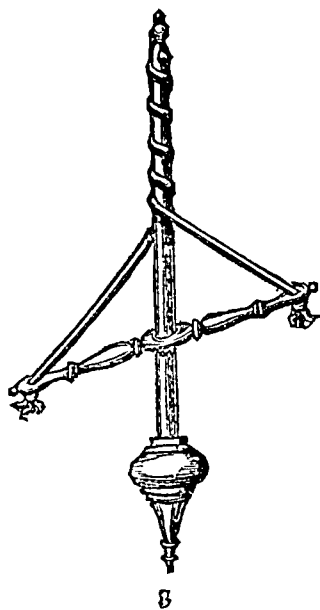
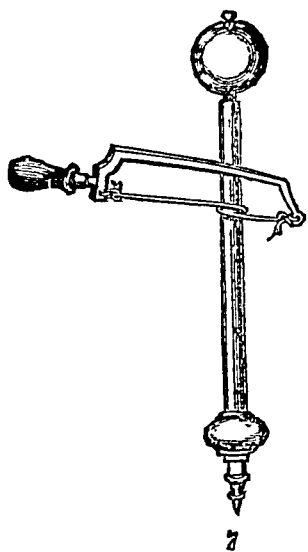
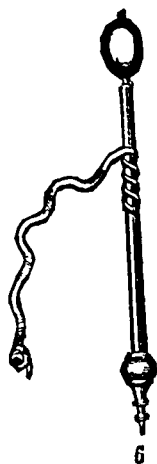


PLATE II.

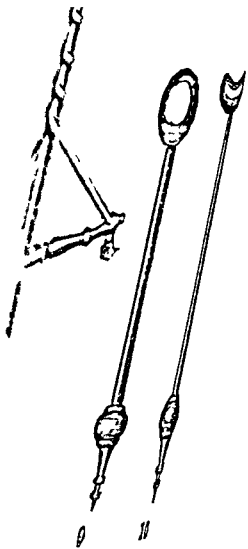
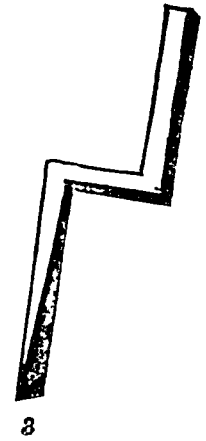
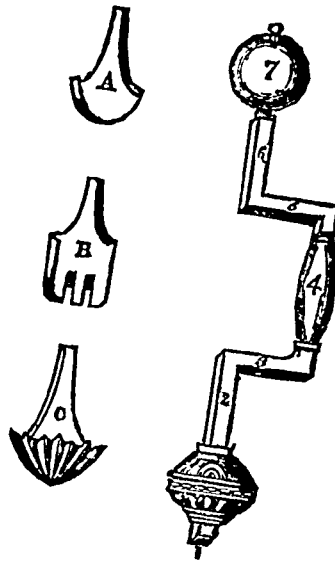
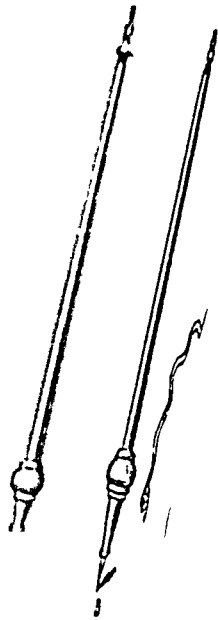
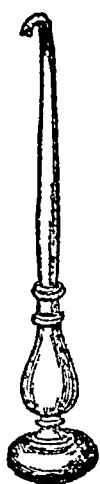
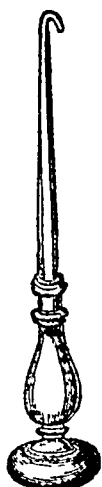


PLATE III.



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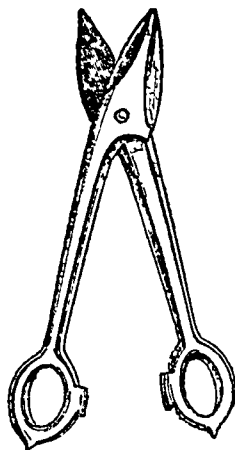
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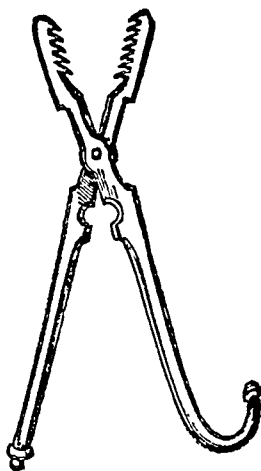
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PLATE IV.

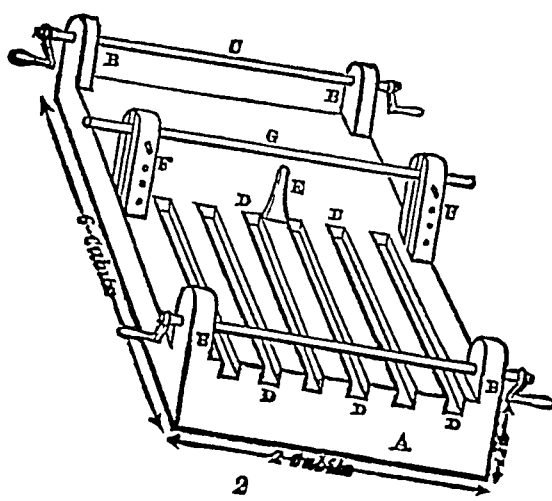
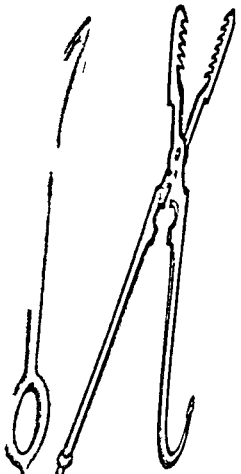
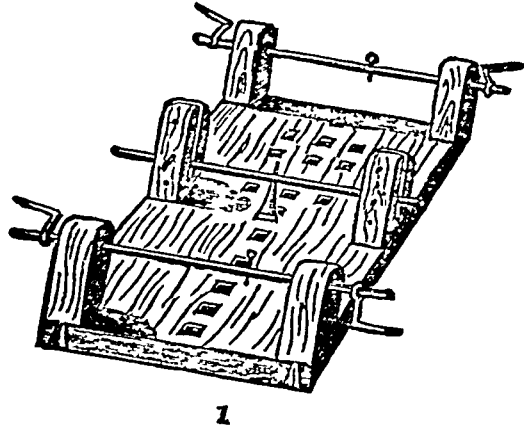
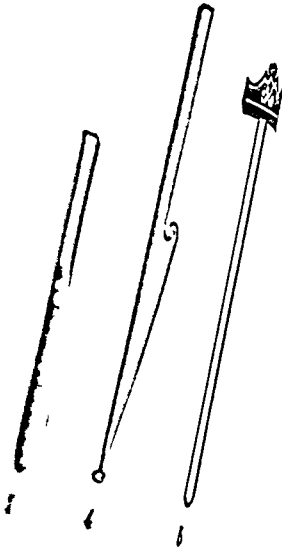
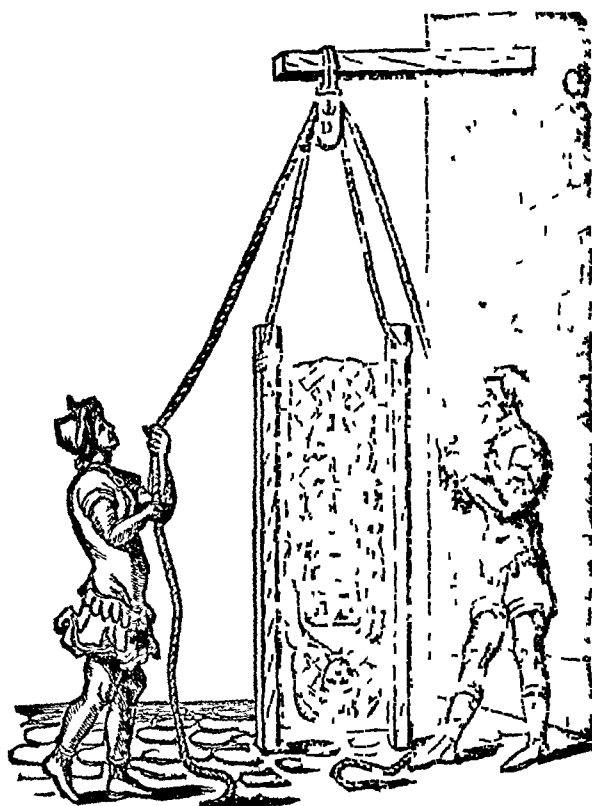


PLATE V



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PLATE VI.

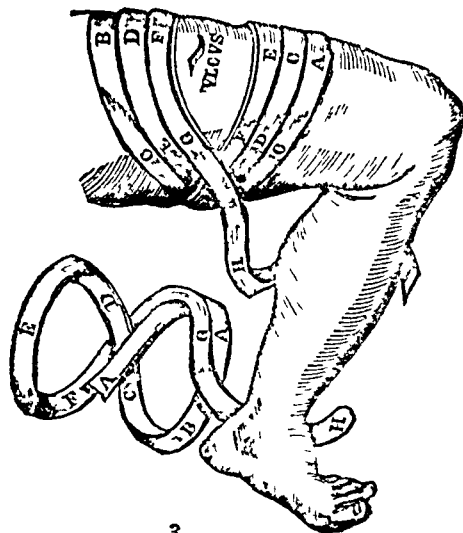
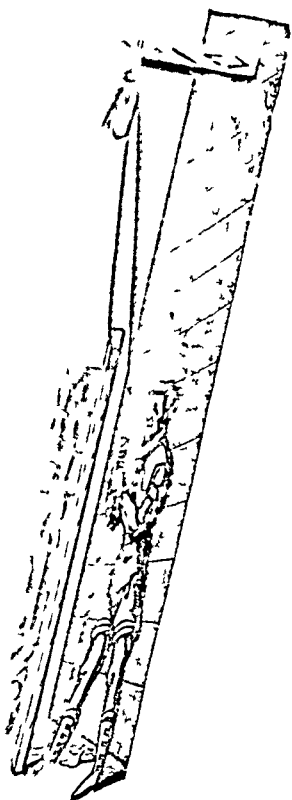
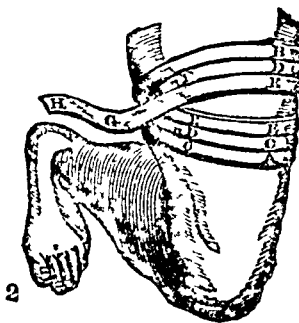
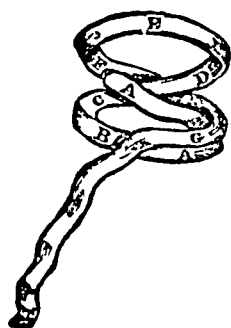
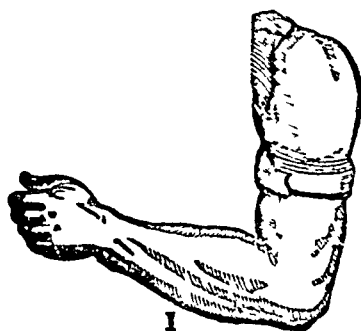
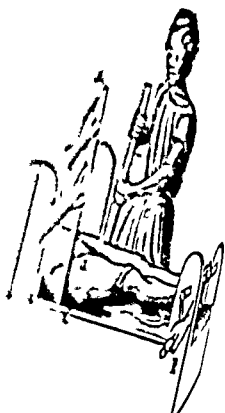
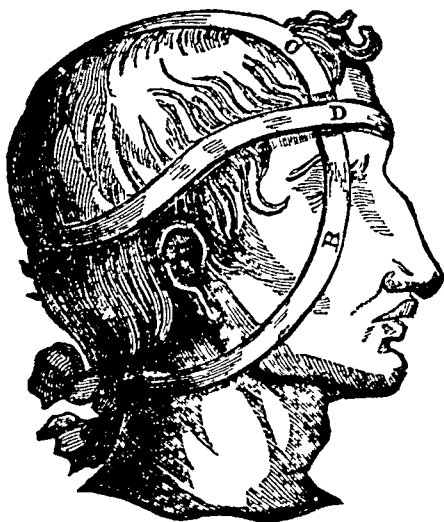


PLATE VII.



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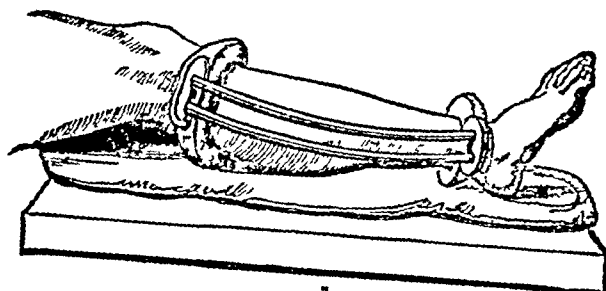


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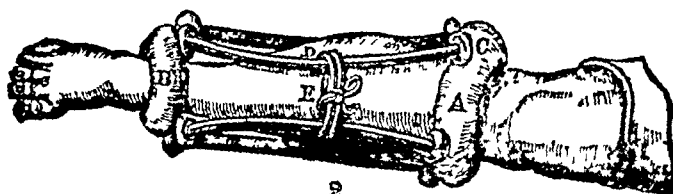


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PLATE VIII.



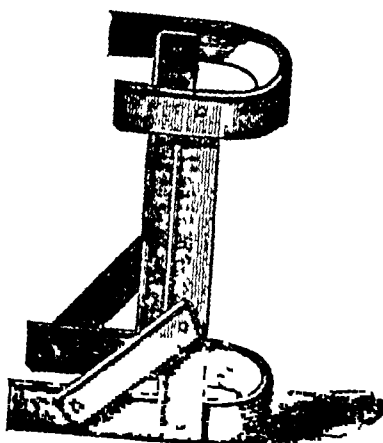
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MEDICAL CLASSICS

VOL 3

December, 1938

NO 4



CONTENTS

Portrait of William Stewart Halsted - - - - - 384

William Stewart Halsted

Biography - - - - - 385

Eponyms - - - - - 386

Bibliography - - - - - 388

Biographies - - - - - 406

Index to Bibliography - - - - - 407

The Radical Cure of Inguinal Hernia in the Male

William S Halsted, M.D - - - - - 412

The Results of Operations for the Cure of the Breast Performed at the Johns Hopkins Hospital from June, 1889 to January, 1894, William Stewart

Halsted, M D - - - - - 441

ERRATUM

The portrait of James Parkinson included in Number X of Volume II of MEDICAL CLASSICS is not that of James Parkinson, 1755-1824. This Dr. James Parkinson is of a later date.

There seems to be no portrait of James Parkinson, 1755-1824, in existence. The Army Medical Library, the British Museum, the Geological Society of London, the Royal Society of Medicine of England, the New York Academy of Medicine Library and the New York State Library are unable to locate one.



WILLIAM STEWART HALSTED IN 1922

Photograph by John H Stocksdale From *William Stewart Halsted Surgeon*
By W G MacCallum Baltimore, The Johns Hopkins Press, 1930

MEDICAL CLASSICS

VOL. 3

December, 1938

NO 4



William Stewart Halsted

BIOGRAPHY

- 1852 Born September 23, in New York City, of English ancestry and a prominent family Taught at home by a governess until 1862 when he entered a private school at Monson, Mass Educated at Phillips Academy, Andover, Mass from 1863 until 1869
- 1874 Age 22 Received A B degree from Yale University
- 1877 Age 25 Graduated from College of Physicians and Surgeons (Columbia University), at head of class, for which he received a prize of \$100 Dr Henry B Sands was his preceptor Interned at Bellevue Hospital
- 1878 Age 26 House surgeon at Bellevue Hospital First house physician at New York Hospital Went abroad for two years, studying at Vienna, Leipzig and Wurzburg
- 1880 Age 28 Upon return to New York became assistant demonstrator of anatomy in College of Physicians and Surgeons and later demonstrator of anatomy until 1885 Began practice which he limited to surgery
- 1881 Age 29 Appointed attending surgeon to Presbyterian and Bellevue Hospitals and assistant attending surgeon to Roosevelt Hospital in New York City. Chief surgeon to dispensary at Roosevelt Hospital until 1886 Surgeon-in-chief to the Emigrant Hospital, Ward's Island, attending surgeon to the Charity Hospital, Blackwell's Island, and substitute attending surgeon to Chambers Street Hospital
- Began to teach surgery by dispensary, bedside and

- laboratory instruction with a group of capable teachers
 Forced to stop work for a time because of poor health
- 1887 Age 35 Transferred to Baltimore, under leadership of Dr Welch at newly opened Pathological Laboratory at Johns Hopkins University, where he was in association with such workers as Mall, Councilman, Nuttall, Walter Reed, Abbott, Flexner and others
- 1889 Age 37 Appointed Professor of Surgery in Johns Hopkins University and Surgeon-in-Chief to Johns Hopkins Hospital "He founded a school of surgery, based upon the most approved scientific principles, the distinguishing characteristics of which were honesty of purpose and thoroughness in method" (Finney)
- 1913 Age 61 When the Johns Hopkins Hospital placed its chair of surgery on a full time basis, Halsted gave up an extensive practice to occupy the chair
- 1922 Age 70 Died Sept 7 of pneumonia following an operation for gallstones

Fellow of American Surgical Association

Fellow of American Academy of Arts and Science

Fellow of American Society of Pathologists and Bacteriologists

Honorary Fellow Deutsche Gesellschaft für Chirurgie

Honorary Fellow Association Française de Chirurgie

Honorary Fellow Royal Swedish Academy of Science

Honorary Fellow Societas Medicarum Svecana, Stockholm

Honorary Fellow Royal Society of Surgeons of England in 1900

Honorary Fellow of many other foreign surgical societies

LL B Yale

D Sc Columbia 1904

LL B Edinburgh, 1905

EPONYMS

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- 3 LINE OF ANASTOMOSIS The anastomosing channel between the inferior and superior thyroid vessels from which the parathyroid arteries may arise *Hypoparathyreosis, status parathyreoprivus, and transplantation of the parathyroid glands* Am J M Sc , n s 134 1-12, 1907
- 4 OPERATION—FOR ANEURISM Consists of gradual occlusion of affected arteries with metal bands (aluminum) *The results of the complete and incomplete occlusion of the abdominal and thoracic aortas by metal bands* Tr Sect Surg and Anat , Am M Ass , 587-590, 1906 Also, abstr J Am M Ass , 47 2147-2148, 1906 *The effect of ligation of the common iliac artery on the circulation and function of the lower extremity Report of a cure of ilio-femoral aneurism by the application of an aluminum band to that vessel* Johns Hopkins Hosp Bull , 23 191-220, 1912 Also Tr Am Surg Ass , 30 196-286, 1912
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6. OPERATION—AN ENTERO- OR GASTRO-ENTEROSTOMY In which no clamps are used, all vessels are ligated individually as they are encountered, interrupted sutures are used in part,

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¹ From *Surgical Papers by William Stewart Halsted* Baltimore, The Johns Hopkins Press, 1924 Prepared by Walter C Burket

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cartilage removed from the esophagus by external esoph-
agotomy Case II Three calculi each with a portion of a
soft catheter as a nucleus, removed from the bladder by
lateral lithotomy at one operation Case III A portion
of a bullet removed from the diploe and cranial cavity
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	References	Year
Acoustic tumors	158	1917
Anesthesia	65	1895
	126	1910
Aorta, occlusion of	100, 101	1905
	104, 107	1906
	118	1909
	127	1910
	137	1913
	145	1914
	155	1916
	175	1922
Appendicitis	58, 59	1899
Arteriovenous fistula	157	1917
	164	1919
Artery, aneurism of	120	1909
	133	1912
	146	1914
	156	1916
	169	1920
	173	1921

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	References	Year
Artery, dilatation of	157	1917
	160, 162	1918
Artery, subclavian	46	1892
	152	1915
	154	1916
	170	1921
Bile ducts, surgery of	76	1898
	82	1899
	88	1901
	94	1902
	165	1919
Billings, John Shaw	147	1914
Blood vessels, surgery of	106	1906
Bone tumors	97	1904
Breast, cancer of	23	1888
	28	1890
	60, 62	1894
	77	1898
	109	1907
	134, 141	1913
	151	1915
	172	1921
	179	1922
Breast, cyst of	150	1915
Cancer, x-ray treatment of	96	1903
Carbonic oxide poisoning	3	1883
Carrel—Dakin treatment	159	1917
Cocaine	19	1885
	90	1901
Cystitis	78	1898
Femur, fracture of	2	1883
	8, 9	1884
	105	1906
Foreign bodies	7	1884
	84, 85	1900
Gall-stones	71	1896

	References	Year
Gall-stones— <i>concluded</i>	74	1897
	92	1902
Gastric ulcer and carcinoma	99	1904
Goitre (see thyroid gland)		
Hernia	21	1885
	24, 28, 33	1890
	38	1891
	45	1892
	49	1893
	61	1894
	64	1895
	91	1901
	95	1903
	180	1922
Hygroma, abdominal	167	1920
Intestinal incarceration	1	1883
Intestine, surgery of	22	1887
	35	1891
	75	1898
	83	1899
	125	1910
	132	1912
	171	1921
	174	1922
Intussusception	50	1893
Limbs, replantation of	177	1922
Pancreatic ducts	80	1898
Pancreatitis	87	1901
Parathyroid glands	108, 111	1907
	112, 113	1907
	114, 115	1908
	117, 122	1909
	131	1912
	153	1915
Plastic surgery	69	1896
Skin grafting	32	1890

	References	Year
Spine, injury of	81	1898
Surgeon, training of	98	1904
Suture material	142	1913
Testicle, undescended	34	1890
Thorax, surgery of	119	1909
Thymus	144	1914
	149	1915
Thyroid gland	52	1893
	70	1896
	73	1897
	102	1905
	110	1907
	121	1909
	136, 138	1913
	139, 140	1913
	143	1913
	161	1918
	166	1920
Tiffany, Dr	148	1914
Transfusion	123	1909
	176	1922
Tuberculosis of elbow	10	1884
Tuberculosis of hip	86	1900
Tuberculosis of knee joint	51	1893
Tuberculosis of rectum	72	1896
Tuberculosis, surgical	116	1908
Tuberculosis, treatment of	103	1905
Wounds, infected	159	1917

INTRODUCTION

In the first paper herein reproduced, *The radical cure of inguinal hernia in the male*, Halsted gives an extensive history of the treatment of hernia. In ancient Greece an attempt was made to reduce the hernia and hold it in place by a truss. Hippocrates writes that at times a cautery was applied to the tissues overlying the hernia, after it had been reduced, and the resulting scar sometimes kept the hernia from recurring. Throughout the Middle Ages, hernia was treated in the same way. Gradually operative procedures were introduced, with ligation of the sac and, at a later date, repair of the muscular wall. Halsted discusses the MacBurney operation in which the tissues were not sutured but were allowed to heal by scar formation. He was also well acquainted with the operation devised by Bassini in which the cord was transplanted to a position between the external and internal oblique muscles. Halsted went further with his method and not only transplanted the cord to a subcutaneous position but also resected many of the veins of the cord so that the muscles could be more tightly sutured about the cord. Halsted's operation, or as it is sometimes known, the Hopkins method, is the one which is now most widely used and the paper which describes this operation is therefore a fitting contribution to *Medical Classics*.

The second paper herein reprinted is *The results of operations for the cure of cancer of the breast performed at the Johns Hopkins Hospital from June, 1889 to January, 1894*. Halsted plunges at once into a discussion of recurrence of cancer following removal of the breast and does not concern himself with any historical note on the treatment of breast cancer. He could have told how breast cancers had been treated with all kinds of ointments and salves which often removed the breast but left the cancer still present. The breast had also been raised by passing sutures under it and then removed by a clean sweep of a large knife, the resulting wound was cauterized with a hot iron. But Halsted was concerned with showing the medical profession the necessity of removing, with the affected breast, the pectoralis muscles and axillary glands, in order to completely remove the cancer. His report showed a great advance in the number of patients cured and without local recurrence. Halsted's operation for the radical removal of the breast is the one now performed. The description of this operation is a great landmark in the treatment of cancer and sustains the position of Halsted as one of the great surgeons of all time.



The Radical Cure of Inguinal Hernia in the Male¹

BY

WILLIAM S HALSTED, M D

*Professor of Surgery, Johns Hopkins University, and Surgeon-in Chief to
The Johns Hopkins Hospital*

Published in Johns Hopkins Hospital Bulletin, 4 17-24, 1893

HUHH said, "If no other field were offered to the surgeon for his activity than herniotomy, it would be worth while to become a surgeon and to devote an entire life to this service" Quite as well, certainly, might this be said of operations for the radical cure of hernia. There is, perhaps, no operation which has had so much of vital interest to both physician and surgeon as herniotomy, and there is no operation which, by the profession at large, would be more appreciated than a perfectly safe and sure cure for rupture.

Just now, most of the so-called radical-cure operations are under a cloud. They have not withstood the test of time. Modern textbooks of surgery refer to operations for the radical cure of hernia with more or less misgiving. The newest American surgery² disapproves of operations for the radical cure of reducible hernia if a truss can be worn, and believes that Czerny's method is as good as any, should an operation be necessary.

The most telling blows against radical-cure operations in this

¹ Read at the Annual Meeting of the Medico-Chirurgical Faculty of Maryland, Easton, Maryland, November 17, 1892.

² An American Textbook of Surgery. Keen and White.

country have been dealt, perhaps, by Bull. His papers on the radical cure of hernia and on relapses after the various operations for the radical cure of hernia have produced a profound impression on both practitioners of medicine and practitioners of surgery. Bull concludes the first of these papers¹ as follows: "These observations will, without doubt, be duplicated in the cases yet to be traced, and go to strengthen the conviction that all methods of radical cure will be found unsatisfactory." In his second paper² he writes: "I hold, after the knowledge of these failures and in view of the well-established fact that after the old operations for hernia recurrence has been often long delayed, that it is wise to drop the term *cure* and to estimate the value of given procedures by the relative proportion of relapses."

From 1883 to 1885, Bull operated for the cure of hernia chiefly by what he calls Socin's method—ligature and excision of the sac. From 1885 to 1889 he employed what he calls Banks' method—ligature and excision of the sac, with suture of the pillars of the external ring. Since 1889 he has practised the sewing up of the canal after ligating and excising the sac.

Of the cases operated upon by the first method, at least 27 per cent relapsed within one year, of those operated upon by the second method, at least 40 per cent relapsed within one year, and of those operated upon by the third method, at least 42 per cent relapsed within one year.

"My own results," writes Bull, "as to relapse being no better by the complicated method of suture of the ring alone, or of the ring and canal, than by the simpler method of excision of the sac after ligature, I shall confine myself to that method of operation till other procedures which have stood the test of years make a more promising showing." Bull's results became less promising the longer he observed his cases. From a series of one hundred and thirty-six cases there remained only four which had been over four years without (p 18) recurrence. In his second paper Bull

¹ Bull. On the radical cure of hernia, with results of one hundred and thirty-four operations. *Medical News*, 1890.

² Bull. Notes on cases of hernia which have relapsed after various operations for radical cure.

says "Now that ten years have elapsed since the modern radical operations have been in vogue, we ought to hear of, or have presented to us, patients who have been more than five years, at the least, without relapse. We could naturally expect to see such cases occasionally at a special hospital. But there are none such." Notwithstanding these facts, Bull does not advise that operations for the relief of hernia be discontinued, nor does he wish to discontinue efforts to discover more satisfactory methods for its cure. For, of the cases operated upon, almost all were relieved for a time, and some for several years, and of the cases which had relapsed, the majority were more comfortable than they had been before they were operated upon.

These are admirable papers and faithfully depict what is to be expected if a hernia is operated upon by the methods which Bull has employed. Today, therefore, the majority of surgeons operate for the radical cure of hernia only when the hernia is strangulated or cannot be retained with a truss. A few believe that they have had results good enough to justify their operations upon almost every case which presents itself.

Until the sixteenth century incarcerated hernia was treated only by taxis. If taxis failed, the patient died. An ordinary rupture and stone cutter, Pierre Franco, was the first to relieve incarceration by herniotomy. As preeminent among his fellows as Paré was among surgeons, he is one of the most illustrious figures in surgical history. He has described, and probably was the first to conceive both the intraperitoneal and extraperitoneal methods of herniotomy. The following is an extract from his chapter on herniotomy.¹

"When all other means have failed we proceed to operate. One must have a little staff of the thickness of a goose-quill, or somewhat thicker, and round, on one side flat and half round and it must be rounded off at the front end that one may press forward easier. One makes accordingly an incision at the upper part of the scrotum, drawing towards the pubes, and at the outset makes the opening only just large enough to admit the staff, for one must take care that he does not thrust into the intestines. When one

¹ Lehrbuch der Chirurgie, Bd. III. Eduard Albert

has found the hernial sac, one must insinuate the little staff between it and the groin and then push upwards. The flat side of the staff must be up. It would not succeed if the staff were entirely round for the knife would then glide from side to side. When one has pushed the staff far enough, he cuts upon the flat side of it through the flesh of the scrotum and groin so as not to injure the intestines now that he has made a larger opening, there is no danger in making the opening large enough to enable one to replace the intestines more easily because the sac and the flesh of the belly can then be the more readily stretched, and hence perhaps the intestines be returned the more nearly into their correct position. One must reintroduce them little by little. Should the case occur that they will not go back easily and without great pressure because of too great an accumulation of their contents or on account of inflammation, then one must proceed as follows: one takes the hernial sac and cuts it very delicately upon the nail while one raises the sac with hooks and cuts it through to the intestines, and when one has made an opening large enough to admit the staff one pushes it very gently upwards between the sac and the intestines, at the same time one must push the parts aside so as to see if he is catching the intestines. The intestines, however, are not easily caught because they are homogeneous and smooth. One must accordingly divide the sac upon the staff up to the peritoneum, that is, up to the highest point, namely, to the hole where the intestines begin to descend to the scrotum, but one must make a generous opening into the peritoneum without fear and for the sake of greater safety, just as one does in desperate cases of the kind. One then takes a little piece of fine linen and pushes the intestines gradually back, beginning with those which are higher up towards the peritoneum and which lie nearer to the belly."

The suggestion of Franco to replace the intestines with linen is an excellent one, and for me one of the proofs of his genius. There are to-day many surgeons who have not discovered this device and who labor with the fingers to introduce the slippery intestines. With a piece of gauze one can replace the intestines rapidly and with precision, whereas the manipulation of the

intestines with the fingers is often a ludicrous performance. Paré, about the middle of the sixteenth century, gives precise instructions of performing herniotomy. He was probably the first surgeon to prescribe herniotomy for all cases of incarcerated hernia. But it was not until the end of the seventeenth century or beginning of the eighteenth century that the operation, through the efforts of Wiseman, Petit, and Richter, became generally recognized and practised.

From a clinical, anatomical and pathological standpoint the work of Sir Astley Cooper on hernia is undoubtedly the greatest of all, and very little has been added to our knowledge of hernia of all kinds since his book appeared. From his chapter on the operation for inguinal hernia one gets a good idea of the respect which surgeons at the beginning of this century had for arteries. Speaking, for example, of the division of the little external pubic artery, which always crosses the sac near the external abdominal ring, he says "This circumstance, however, is in no degree alarming to a surgeon who expects it, as the bleeding may be stopped by the vessel being compressed by an assistant, or if the artery is larger than usual, owing to the scrotum being long distended by the disease, the blood may be stopped by a ligature."

Cooper substituted his world-famed herniotome for the bulb-pointed knife, and abolished the use of the hollow director which the disciples of Franco and Paré believed to be indispensable.

Otherwise the technique of herniotomy is to-day precisely that of Franco, the gifted stone and rupture cutter of the sixteenth century, except that in pre-aseptic times he, perhaps wisely, preferred the extraperitoneal¹ to the intraperitoneal method. The actual war which these two methods stirred up among surgeons for more than a century is interesting. On the side of Petit, who after Franco was the great disseminator and defender of the method, we find arrayed from the English, (p. 19) Cooper, Key, Teale, Paget, Liston, Gay, Lawrence, and others, from the Germans, Roser, Shuh, Dummericher, Busch, Baum, and others, from the French, Gosselieu, Chauvet, Le Dentu, and others.

¹ Kocher, by the way, has recently devised an extraperitoneal operation for the radical cure of hernia — (*Correspondenzblatt für Schweizer Aerzte*, 1892)

The same objections and the same refutations appear year after year. The inconsistency of those opposed to the extraperitoneal method is remarkable. They were, for example, all of them advocates of the taxis, and would not resort to the cutting operation until the taxis had failed, but objected to the extraperitoneal herniotomy because of the danger of returning unseen the contents of the sac. Richter is the only one to whom it occurred pointedly to inquire why that should be feared at the time of the operation which had not been feared a quarter of an hour earlier when taxis was being performed.

Dieffenbach, the most conspicuous advocate of the intraperitoneal method for inguinal and femoral hernias, permits the extraperitoneal method for umbilical and ventral hernias, because "it lessens the danger of peritonitis."

From Celsus we have reports of operations for the cure of reducible hernias. At that time it was believed that many hernias were accompanied by a rent in the peritoneum. The incision was made down to the hernial contents, and the supposed rent in the abdominal wall was closed by sutures.

Heliodorus gives a most masterly description of an operation for the radical cure of hernia which would be a creditable performance to-day. The directions which he gives for cutting off the sac are unique, and as follows¹: "We must cut off the hernial sac with great care, for if we take away less than is protruded, the result will be the production of a new hernia, for the edges of the wound will be slack and the way prepared for the slipping out again of the intestines. If one resects more than is protruded by drawing out additional peritoneum from its legitimate resting-place, then the hernia will recur, for the edges of the peritoneum, because of the too great resection, cannot be brought together, and the patient is in danger because normal parts have been taken away. In order, therefore, that we may not miss excising an amount which is precisely correct it is necessary to draw the sac outwards by catching the tip of the same, so soon as the edges of the abdominal wound begin to be everted, enough of the peritoneum has been drawn out and so much is to be excised. If

¹ Lehrbuch der Chirurgie, Bd. III. Eduard Albert.

the edges of the abdominal wound have been strongly everted, then one must assume that more peritoneum has been drawn out than is necessary and should pull with less force. When just enough peritoneum has been drawn out the sac is to be twisted. Having been cut off along a straight line, the peritoneum becomes folded upon itself and screwed up and closed so tight that not even the point of a probe can be introduced."

That Heliodorus recognized the existence of the infundibuliform fascia there can be no doubt,¹ for he says that one has not reached the true hernial sac until the last of the layers which enclose together the hernial tumor and the spermatic cord has been divided. With the exception of the torsion of the sac, which we replace with the suture, the operation for the radical cure of hernia in the time of the Roman emperors was quite on a par with the operation as it is usually performed in our day. Four hundred years later the operation had ceased to exist.

I am not inclined to attach much importance to the manner of closing the sac, nor to the level at which it is cut off, nor to the treatment of the sac in general, provided the peritoneum is not allowed to protrude outwards into the wound. With the revival of the operation for the radical cure the testicle was sacrificed. Paul of Aegina directs that the sac be ligated at two places, and that, cutting between the ligatures, the testicle and sac be removed. The Arabians did not advance beyond this method. At length when it occurred to Lanfrancus to attempt to cure hernia without sacrificing the testicle, he believed that the inspiration was from God. In 1882 and 1883 Kraske advised castration in certain difficult cases for the cure of hernia.

Guido von Cauliaco, although not sacrificing the testicle himself, was inclined to excuse others for doing so, because the hernia was less likely to return after the testicle had been removed, and the generating power was not lost. This observation of Guido von Cauliaco is interesting because it implies that in the Middle Ages the cord must have been regarded as the important factor in the production of hernia. From that time to the introduction of antiseptic surgery, methods of all sorts, many of them

¹ Albert, l c

cruel and some barbarous, have been in vogue They may be classified as follows

- 1 Pressure with or without the simultaneous application of irritating and so-called contracting remedies
- 2 Caustics and the actual cautery
- 3 Ligature of the sac, with or without cutting it off
- 4 Introduction of foreign bodies into the hernial sac
- 5 Healing in of a detached portion of skin, or of a portion of impacted skin into the abdominal ring
- 6 The injection of irritating fluids within or outside of the hernial sac
- 7 The subcutaneous suture

Some of these methods are interesting as curiosities, and others because they are still practised

The employment of the actual cautery for the cure of hernia appealed particularly to the knife-dreading Arabian school¹ After the rupture had been returned and the cord drawn aside, the cautery was applied over the external abdominal ring and kept there until it had burnt through the skin and hernial sac down to the bone The region of the external abdominal ring having been described by Paul of Aegina as triangular, three different cautery points were sometimes used for this operation—a straight one for the center point, a gamma-shaped one for the sides, and a lens-shaped one for the surface of the triangle The celebrated *filium aureum* or *punctum aureum*, the golden ligature or the golden puncture, was introduced by Geraldus in Metz The sac was laid bare and then occluded by a golden thread so passed as not to include the spermatic cord

Wood's subcutaneous suture is still practised in Great Britain, and, according to Bassini, has for years been the favorite method in Italy I can remember when in New York the (p 20) honors were about equally divided between Wood's method and Heaton's injection method So late as 1882, J H Warren, of Boston, wrote a book in behalf of his injection method, which is essentially the same as Heaton's The injection of alcohol (*Schwalbe*) is quite popular in Germany and France

¹ Albert, l c.

With the introduction of antiseptic surgery, or rather several years after Lister's first contributions to this subject, Annandale, Steele, Riesel, Nussbaum, and a few others, made bolder attempts to cure ruptures. Although differing from each other in detail, the methods of these surgeons were essentially alike and are embraced under the following heading: Ligature of the exposed neck of the sac, with extirpation or incision of the sac.

We are indebted to antiseptic surgery for reintroducing to us the operation of Heliodorus.

In 1878, Czerny, in his valuable *Beitrag zur Chirurgie*, records seven cases in which after ligating the neck of the sac and excising the sac he had sutured the pillars of the external abdominal ring. He attributes to Richter the conception of the operation, saying that it was believed by Richter that for the radical cure of hernia not only must the hernial sac be destroyed but also must the ring be narrowed. He courteously concedes also to Billroth, to whom his *Beitrag* are dedicated, credit for the idea because Billroth had said, "If we could artificially produce tissues of the density and toughness of fascia and tendon, the secret of the radical cure of hernia would be discovered." Some years later, Banks published what he supposed to be a new operation for the radical cure of hernia. Although practically the same as Czerny's, it was for several years known as Banks' operation in this country and in Great Britain.

I am surprised to see that Lauenstein, so recently as 1890, accredits Banks with Czerny's operation. Lauenstein's ideas of Czerny's operation were perhaps obtained from the latter's first publication, and not from his *Beitrag zur Chirurgie*, for in his *Beitrag zur Chirurgie* Czerny regrets that he did not remove the sac in his earlier operations. That Banks uses silver wire instead of silk or catgut in sewing together the pillars of the external abdominal ring, and that he possibly cuts off the sac at a higher level than Czerny does, hardly entitles him to the operation. The use in general of powerful sewing materials in surgery is, it seems to me, based on a misapprehension in pathology. If, for example, the tension is so great that wire must be used to bring parts together, one must not expect permanent assistance from the

wire, for the tissues will eventually be cut through by the stitches to the extent necessary to relieve the tension

Czerny had not observed his cases long enough to undeceive him as to the value of his operation, and he expresses himself very cautiously as to its ultimate results. He sets an excellent example for less conscientious surgeons when, agreeing with Schede, he does not propose to operate upon controllable ruptures until the experience of many years with ruptures which cannot be controlled by a truss shall have convinced him of the safety and reliability of his method

In 1879, Tilanus of Amsterdam collected for the International Medical Congress data from one hundred and twenty-two cases which had been operated upon by what were supposed to be antiseptic methods. Of the ultimate results not enough has been ascertained to enable one to form conclusions. The mortality was 6 per cent, or too great to justify operating upon ruptures which could be comfortably retained by a truss

The most important contributions since Czerny's to the radical cure of hernia are from McEwen, McBurney, Bassini, Kocher, and Lucas-Championnière. In his own hands, McEwen's operation seems to have been perfect. It is difficult to say upon just what part of the operation its success depends. I am not inclined to ascribe it to the tampon, although Lauenstein testifies that he was fortunate enough to see the anatomical preparation from a patient cured by McEwen's method who for years subsequent to the operation had done heavy work without a truss. The patient died of an aortic aneurism. His inguinal canal was firmly closed, and on the abdominal side of the same and firmly adherent was the sac folded up into a dense cushion, which strengthened the abdominal wall in this situation. Unlikely as this may seem, we must unhesitatingly accept the testimony of such men as Lauenstein and McEwen. Bassini, on the other hand, had an opportunity to observe at an autopsy ninety-five days after the operation, that the tampon which he had made somewhat after the manner of McEwen's had been completely absorbed, not a trace of it remained. One is so familiar with the fate of redundant tissues that it is hard to convince oneself that

the tampon remains for years just as it was at the operation, and that even if not entirely absorbed it is not at least greatly reduced in size. The tampon being in place, the first step of McEwen's operation is concluded. The second step is to restore the valve-like form of the inguinal canal. This is done by one or more mattress sutures which unite the conjoined tendon to the aponeurosis of the oblique muscle. The application of these sutures is simple, although from the description it would seem to be complicated.

How much McEwen's wonderfully good results might be attributed to the wearing of trusses would depend upon the percentage of truss-wearers. It is strange that so little success has attended the practice of McEwen's operation in this country. Is the fault with the operator or with McEwen's description of the operation? Whatever the future of this operation may be, McEwen certainly took an advance-step in the treatment of inguinal hernia.

McBurney's operation is undoubtedly so well known to all Americans that a description of it would be superfluous. It would seem to be the most heroic test which is possible of scar-tissue and open-wound treatment. But scar tissue, however thick and dense, is not the tissue best calculated to recover from the effects of blows, or to permanently withstand the constant pressure of the abdominal contents. McBurney has kindly informed me by letter that although the hernia has recurred in some of his cases, the percentage of recurrence is so small that he still practises his method. Bull tabulates several relapses after McBurney's operation. More than three years ago I described a new operation for the cure of inguinal hernia in the male.¹ Six or eight months later, Bassini of Padua published his operation for the cure of inguinal (p. 21) hernia which he had performed two hundred and fifty-one times, with only seven returns and no deaths except one, and that from pneumonia after the wound had healed.

Bassini's operation and mine are so nearly identical that I

¹ Bulletin of the Johns Hopkins Hospital, Vol. I, No. 1, Johns Hopkins Hospital Reports, Vol. II, surgical fasciculus, No. 1.

might quote his results in support of my operation. Instead of trying to repair the old canal and the internal abdominal ring, as McEwen had tried to do, I make a new canal and a new ring. The new ring should fit the cord as snugly as possible, and the cord should be as small as possible. The skin incision extends from a point about 5 cm. above and external to the internal abdominal ring to the spine of the pubes. The subcutaneous tissues are divided so as to expose clearly the aponeurosis of the external oblique muscle and the external abdominal ring. The aponeurosis of the external oblique muscle, the internal oblique and transversalis muscles and the transversalis fascia are cut through from the external abdominal ring to a point about 2 cm. above and external to the internal abdominal ring. The vas deferens and the blood-vessels of the cord are isolated. All but one or two of the veins of the cord are excised. The sac is carefully isolated and opened and its contents replaced. A piece of gauze is usually employed to replace and retain the intestines. With the division of the abdominal muscles and the transversalis fascia the so-called neck of the sac vanishes. There is no longer a constriction of the sac. The communication between the sac and the abdominal cavity is sometimes large enough to admit one's hand. The sac having been completely isolated and its contents replaced, the peritoneal cavity is closed by a few fine silk mattress sutures, sometimes by a continuous suture. The sac is cut away close to the sutures. The cord in its reduced form is raised on a hook out of the wound to facilitate the introduction of the six or eight deep mattress sutures, which pass through the aponeurosis of the external oblique and through the internal oblique and transversalis muscles and transversalis fascia on the one side, and through the transversalis fascia and Poupart's ligament and fibers of the aponeurosis of the external oblique muscle on the other.

The two outermost of these deep mattress sutures pass through muscular tissues and the same tissues on both sides of the wound. They are the most important stitches, for the transplanted cord passes out between them. If placed too close together, the circulation of the cord might be imperiled, and if too far apart, the

hernia might recur They should, however, be near enough to each other to grip the cord The precise point out to which the cord is transplanted depends upon the condition of the muscles at the internal abdominal ring If in this situation they are thick and firm, and present broad raw surfaces, the cord may be brought out here But if the muscles are attenuated at this point, and present thin cut edges, the cord is transplanted farther out The skin wound is brought together by buried skin sutures of very fine silk ¹ The transplanted cord lies on the aponeurosis of the external oblique muscle and is covered by skin only In both of the patients presented you will feel the cord in this situation distinctly They were operated upon two and three and one-half years ago

Bassini believes that he restores the inguinal canal to its physiological condition, inasmuch as he makes "a canal with two openings, an abdominal and a subcutaneous, furthermore with two walls, a posterior and an anterior, through the middle of which the spermatic cord passes obliquely" But the original canal is not by any means an affair so simple as Bassini's To reproduce the equivalent, anatomically and physiologically, of the inguinal canal is, I believe, impossible Moreover, we do not know that nature has made the best possible provision against hernia in providing as it does for the passage of the cord through the abdominal wall Bassini's operation, although essentially the same as my operation, is different in some respects 1 Bassini always brings the cord through the muscles at the internal abdominal ring The point out to which I transplant the cord is determined, as I have said, by the condition of the muscles 2 Bassini does not excise the superfluous veins I believe that it is advisable to reduce the size of the cord as much as is practicable 3 In Bassini's operation the cord lies posterior to the aponeurosis of the external oblique muscle, in mine, between this aponeurosis and the skin To secure for the cord the position which Bassini recommends an additional row of stitches is re-

¹ Instead of the interrupted buried skin suture as shown in Plate III, we now use an uninterrupted buried skin suture without knots, which is withdrawn after two or three weeks

quired Unless it should be demonstrated by a comparison of the results of the two methods that there is something to be gained by these additional stitches, it would be well for the sake of the wound and the operator to discard them

Kocher thinks that the methods of Bassini and himself are to be preferred to other methods, McEwen's for example, because they (the former) enable the patient to get out of bed on the eighth day I fail to see anything in the methods of Kocher and Bassini and myself which might enable the patient to get out of bed earlier than if he had been operated upon by the method of McEwen The time to be spent in bed depends upon the judgment of the surgeon and not, open methods excluded, upon the particular method Our patients are kept upon their backs for 21 days Wounds thoroughly healed throughout per primam are not strong in eight days One can easily tear open a typically healed wound which is not more than six or seven days old Not long ago in attempting to restore a club foot to its proper position I accidentally and with very little force pressed wide open a wound which had healed in the typical way and was eight days old

A wound is certainly stronger on the fourteenth day than it is on the seventh, and stronger on the twenty-first day than on the fourteenth Just how long wounds of skin and muscle which have healed by first intention may continue to increase in strength we do not know In our hernia wounds, the subcutaneous ridge of the aponeurosis and muscle which results when the parts have been brought together properly by buried mattress stitches does not disappear entirely for five or six or more weeks I sometimes question the propriety of allowing, as I do, my patients to walk about on the twenty-first day

The technique of operations for the radical cure of hernia should be unusually perfect, because we have to violate occasionally what I consider to be one of the most important principles of antiseptic surgery We have to constrict the tissues somewhat with our deep sutures It is not always possible to (p 22) bring together the pillars of the external abdominal ring without a little tension One can of course make relaxation cuts, but these would be quite as undesirable as a moderate amount

of tension Our hernia wounds illustrate admirably the danger of constricting tissues We never resort to drainage of any kind for fresh wounds And with the exception now and then of a hernia wound, none¹ of our fresh wounds suppurate Inasmuch as we rarely if ever have occasion to constrict tissues in other fresh wounds, it is almost certain that the occasional stitch abscess in a hernia wound is due to tissue constriction plus, of course, the infection To provide for a good circulation in every particle of tissue in and immediately about a wound is as much a part of our technique as are the ordinary antiseptic precautions The better the circulation the less the likelihood of suppuration²

Since the opening of the Johns Hopkins Hospital, 3½ years ago, 82 operations for the radical cure of hernia have been performed, and without a death 64 of the cases were males, 18 were females Of the females, four had femoral, 13 inguinal and one umbilical hernia Of the males, 63 had inguinal and one femoral hernia Five of the males were operated upon by Dr Brockway by McBurney's method Of these five cases two have recurred, two have not been heard from, and one, a boy 2½ years old, is still well, 20 months after the operation The cord in so young a patient is so very small that the hernia might be cured for several years by almost any method

My operation, with or without modification, was employed in 58 cases Of the cases which healed per primam, not one has recurred The wounds which suppurated were immediately laid wide open and allowed to heal by granulation For the result in such cases the open method, and not mine, is responsible There have been six recurrences—Nos 2, 12, 24, 27, 39, 52 No 2 took cathartics and got out of bed a few days after the operation

¹ Not more than one or two in a year *Vid* Johns Hopkins Hospital Reports, Vol 2, surgical fasciculus, No 1

² I have performed three amputations within a year and a half through tissues which were almost surely infected and with instruments and hands which were as surely infected No attempt was made to disinfect the wounds except that they were washed with a sterilized salt solution, and in one instance with warm water from the faucet Great care was exercised in ligating and sewing and dressing to avoid constricting the tissues and to provide against tension The wounds were closed as usual They all healed absolutely by first intention

He was discharged for insubordination on the eighth day, before his wound was firm. In No. 12 the cord was not transplanted. In No. 24 a stitch abscess formed several weeks after his discharge. There is a slight impulse, on coughing, at the site of the abscess. In No. 27 the wound suppurated. The stitches were removed and the wound was laid wide open and allowed to heal by granulation. This patient had a diffuse suppurative inflammation of the neck at the time of the operation. No. 39, the wound was opened for hemorrhage and allowed to heal by granulation. No. 53, the wound suppurated, was laid open, and healed by granulation. The patient has a flabby abdominal wall. The scar has stretched throughout its entire length, and there is an impulse all along the scar on coughing.

STATISTICS OF OPERATIONS AT THE JOHNS HOPKINS HOSPITAL FOR
THE RADICAL CURE OF HERNIA¹

1 W H R, aet 8 Large, right, congenital, inguinoscrotal, reducible hernia. Operation, 13, 6, 1889. Healed per primam. Last observation, 1, 6, 1891, the result is still perfect, 2 years after the operation.

2. G H, aet 20 Large, right, oblique, inguino-scrotal, reducible hernia. Operation, 17, 6, 1889. Healed per primam. Discharged for insubordination, 24, 6, 1889. Patient got out of bed several times and took cathartic pills without permission. 14, 6, 1892, there is a complete return of the hernia.

3 J B, aet 48 Very large, right, oblique, inguino-scrotal, reducible hernia. Operation, 16, 8, 1889. The bladder was caught in one of the stitches, and the wound, consequently, was laid open and allowed to heal by granulation. Last observation, 10, 3, 1892, the hernia has not returned, 2½ years after the operation.

4 M E L, aet 14 Small, right, oblique, inguinal, reducible hernia. McBurney's operation, 19, 8, 1889. Last observation, 21, 3, 1892, the hernia has not returned, 2½ years after the operation.

5 J D, aet 8 Small, left, oblique, inguinal, reducible hernia.

¹ A few cases have been added to this list since the reading of the paper.

Operation, 9, 10, 1889 Healed per primam Last observation, 5, 3, 1892, the result still perfect, 2 years and 5 months after the operation

6 C I B, aet 38 Small, left, femoral, reducible hernia Operation, 11, 10, 1889 Healed per primam Discharged, 4, 11, 1889

7 F F, aet 7 Small, right, congenital, inguinal, reducible hernia Operation, 12, 10, 1889 Healed per primam Last observation, 25, 3, 1892, result still perfect, 2 years, 5 months after the operation

8 J W F, aet 12 Left, oblique, inguinal, reducible hernia Operation, 21, 12, 1889 Healed per primam Last observation, 30, 1, 1890, result still perfect 1, 3, 1892, patient cannot be found

9 S McN, aet 46 Large, right, femoral, strangulated hernia Operation, 31, 12, 1890 Discharged, 2, 2, 1891 Result unknown

10 L L, aet 27 Small, right, oblique, inguinal, reducible hernia Operation, 14, 2, 1890 Open wound, 21, 3, 1892, the hernia has not returned

11 H S, aet 37 Large, right, inguinal reducible hernia Operation, 21, 2, 1890 Healed per primam Last observation, 1, 12, 1892, linear scar, result still perfect, nearly three years after the operation

12 G G, aet 28 Large, left, oblique, inguino-scrotal, irreducible hernia Operation, 2, 5, 1890 Cord not transplanted Healed per primam 14, 10, 1890, the hernia has recurred

13 J H, aet 39 Small, left, direct, inguinal, reducible hernia Operation, 20, 5, 1889 Healed per primam Last observation, 21, 6, 1890, the hernia has not recurred

14 E H, aet 35 Small, left, femoral, strangulated hernia Operation, 17, 5, 1890 Discharged, 22, 6, 1890 Result unknown

15 E P, aet 45 Small right, oblique, inguinal, reducible hernia Operation, 29, 5, 1890 Healed per primam Last observation, 16, 6, 1890, the hernia has not recurred

16 H B, aet 8 Small, right, inguinal, reducible hernia

McBurney's operation, 17, 7, 1890 Not heard from since discharged, 23, 8, 1890

17 H D, aet 2½ Right, inguino-scrotal, congenital, reducible hernia McBurney's operation, 17, 7, 1890 Last observation, 1, 3, 1892, the hernia has not recurred

18 A E, aet 5 Small, right, oblique, inguinal, reducible hernia McBurney's operation, 23, 7, 1890 24, 11, 1890, the hernia has recurred

19 G W, aet 45 Small, right, oblique, inguinal, reducible hernia McBurney's operation, 23, 5, 1890 Not heard from since discharged, 8, 9, 1890

(p 23) 20 K F, aet 11 Small, right, oblique, inguinal, reducible hernia McBurney's operation, 4, 8, 1890 Last observation, 27, 3, 1892, the hernia has not recurred

21 E. W, aet 5 Small, left, oblique, inguinal, reducible hernia McBurney's operation, 11, 8, 1890 11, 11, 1890, the hernia has recurred Patient wears truss

22 D H, aet 9 Small, left, oblique, inguinal, reducible hernia. Operation, 23, 8, 1890 Healed per primam Last observation, 23, 3, 1892, linear scar, result still perfect

23 T Y, aet 52 Large, right, oblique, inguinal, irreducible hernia Operation, 17, 9, 1890 The adhesions were too firm and too extensive to admit of the reduction of the hernia

24 J C H, aet 27 Large, left, oblique, inguinal, reducible hernia Operation, 24, 9, 1890 Healed per primam Last observation, 15, 11, 1892 A few weeks after the patient had left the hospital a small abscess formed about one of the stitches Just at this spot there is a distinct impulse on coughing

25 G S, aet 49 Large, left, oblique, inguino-scrotal, irreducible hernia Operation, 27, 9, 1890 The operation was a difficult one and consumed two hours Stitch abscess, 1, 3, 1892 Patient cannot be found

26 C M, aet 4 Large, right, inguinal, congenital, reducible hernia Operation, 7, 10, 1890 Healed per primam 1, 3, 1892, patient cannot be found

27 M C, aet 20 Large, right, oblique, inguino-scrotal, reducible hernia Operation, 26, 11, 1890 Healed per primam.

The wound had been healed nearly three weeks when an abscess formed about the outermost stitch. This might be accounted for by the fact that the patient had at the time an acute purulent inflammation of the neck. Last observation, 5, 6, 1892, the hernia is beginning to recur.

28 W McS, aet 3. Large, right, oblique, inguinal, strangulated hernia. Operation, 10, 11, 1890. Healed per primam. Last observation, 25, 3, 1892, firm linear scar, result still perfect.

29 E L P, aet 7. Small, right, oblique, inguinal, reducible hernia. Operation, 21, 11, 1890. Healed per primam, except for a small stitch abscess. Last observation, 20, 3, 1892, linear scar, perfect result.

30 A M, aet 15. Left, oblique, inguinal, reducible hernia. Operation, 24, 11, 1890. Healed per primam. Last observation, 28, 3, 1892, linear scar, perfect result.

31 S P, aet 30. Small, right, direct, inguinal, reducible hernia. Operation, 29, 1, 1891. Healed per primam. Last observation, 2, 4, 1892, linear scar, perfect result.

32 F H, aet 40. Small, right, oblique, inguinal, reducible hernia. Operation, 28, 1, 1890. Healed per primam. Last observation, 30, 3, 1891, linear scar, perfect result.

33 J W, aet 28. Small, right, oblique, inguinal, reducible hernia. Operation, 23, 1, 1891. Healed per primam, 1, 6, 1892, cannot be found.

34 F S, aet 27. Small, left, oblique, inguinal, reducible hernia. Operation, 6, 2, 1891. Healed per primam, except for a minute stitch abscess. Last observation, 2, 3, 1891, linear scar.

35 J L, aet 14. Small, left, oblique, inguinal, reducible hernia. Operation, 20, 2, 1891. Wound suppurated. Last observation, 1, 3, 1892, hernia has not recurred.

36 J T, aet 47. Small, right, oblique, inguinal, reducible hernia. Operation, 24, 2, 1891. Healed per primam. Last observation, 15, 11, 1892, linear scar, perfect result.

37 P J, aet 6. Small, left, oblique, inguinal, reducible hernia. Operation, 17, 3, 1891. Healed per primam. Last observation, 14, 4, 1891, result still perfect.

38 E K, aet 27 Small, left, direct, inguinal, reducible hernia Operation, 13, 3, 1891, open wound Last observation, 21, 3, 1892, the hernia has not recurred

39 E J C, aet 23 Small, right, oblique, inguinal, irreducible hernia Operation, 5, 6, 1891, the wound was opened completely for hemorrhage Healed by granulation 2, 4, 1892, the hernia has recurred

40. M P, aet 35 Left, oblique, inguinal, reducible hernia Operation, 8, 5, 1891 Stitch abscess 1, 6, 1892, patient cannot be found

41 F S, aet 14 months Small, right, inguino-scrotal, congenital, reducible hernia Operation, 19, 5, 1891 Healed per primam 1, 6, 1892, patient cannot be found

42 J K, aet 4 Right, oblique, inguino-scrotal, reducible hernia Operation, 26, 6, 1891 Wound suppurated Last observation, 5, 4, 1892, the hernia has not recurred

43 F D., aet 49 Small, right, oblique, inguinal, reducible hernia Operation, 26, 6, 1891 Stitch abscess Last observation, 3, 4, 1892, the hernia has not recurred

44 P H, aet 5 Left, oblique, inguinal, irreducible hernia Operation, 11, 9, 1891 2, 10, 1891, stitch abscess 1, 3, 1892, patient cannot be found

45 P C, aet 28 Small, right, direct, inguinal, reducible hernia Operation, 16, 7, 1891 Wound healed per primam 23, 3, 1892, patient cannot be found

46 W G W, aet 2½ Small, right, inguino-scrotal, congenital, reducible hernia Operation, 25, 7, 1891 Wound healed per primam Last observation, 1, 4, 1892, linear scar, perfect result

47 G B, aet 22 Right, oblique, inguino-scrotal, reducible hernia Operation, 4, 8, 1891. Wound healed per primam Last observation, 1, 7, 1892, linear scar, perfect result

48 A McI, aet 26 Right, oblique, inguino-scrotal, strangulated hernia Operation, 8, 9, 1891 Wound suppurated Last observation, 1, 3, 1892, the hernia has not recurred

49 M W, aet 11 Right, inguino-scrotal, congenital, re-

ducible hernia Operation, 27, 8, 1891 Wound healed per primam Last observation, 1, 11, 1891, the hernia has not recurred

50 G B, aet 3 Small, right, oblique, inguinal, reducible hernia Operation, 30, 9, 1891 Wound healed per primam Ultimate result unknown

51 J W B, aet 5 Small, left, oblique, inguinal, reducible hernia Operation, 9, 10, 1891 Stitch abscess Last observation, 3, 3, 1892, the hernia has not recurred

52 H P, aet 29 Small, right, oblique, inguinal, irreducible hernia Operation, 9, 10, 1891 Wound suppurated Healed by granulation Last observation, 20, 3, 1892, the scar has stretched throughout its entire length Truss advised

53 E L B, aet 28 Small, right, oblique, inguinal, reducible hernia Operation, 3, 12, 1891 Wound healed per primam Last observation, 7, 4, 1892, linear scar, perfect result

54 A M, aet 4 Small, right, oblique, inguinal, strangulated hernia Operation, 25, 11, 1891 Stitch abscess Last observation, 6, 4, 1892, the hernia has not recurred

55 H B, aet 21 Small, left, oblique, inguinal, reducible hernia Operation, 10, 12, 1891 Stitch abscess 1, 6, 1892, patient cannot be found

56 H R, aet 20 Small, right, oblique, inguinal, irreducible hernia Patient's hernia has been once unsuccessfully operated upon by another surgeon Operation, 8, 1, 1892 Wound healed per primam Last observation, 3, 1, 1893, linear scar, perfect result

57 H H, aet 2 Small, right, oblique, inguinal, reducible hernia Operation, 12, 2, 1892 Wound healed per primam 1, 3, 1892, patient cannot be found

58 A F, aet 30 Very large, left, oblique, inguino-scrotal, reducible hernia Operation, 23, 2, 1892 Wound healed per primam 1, 3, 1892, patient cannot be found

59 K H, aet 30 Large, left, oblique, inguino-scrotal, reducible hernia Operation, 4, 3, 1892 Wound healed per primam A drop or two of pus about one stitch 1, 3, 1893, patient cannot be found

60 C S, aet 28 Small, right, oblique, inguinal, irreducible hernia Operation, 11, 3, 1892 The wound healed per primam 1, 6, 1892, patient cannot be found

(p 24) 61 J S L, aet 47 Large, left, oblique, inguino-scrotal, reducible hernia. Operation, 22, 4, 1892 Stitch abscess 1, 3, 1892, patient cannot be found

62 J. F, aet 38 Very large, right, oblique, inguino-scrotal, strangulated hernia Operation, 12, 5, 1892 The wound healed per primam Patient had parotid abscess on both sides Last observation, 22, 6, 1892, linear scar

63 C C, aet 16 Small, left, oblique, inguinal, reducible hernia Operation, 27, 5, 1892 The wound healed per primam Last observation, 27, 6, 1892, linear scar

64 M W, aet 45 Large, left, oblique, inguinal, strangulated hernia Operation, 22, 5, 1892 Wound healed per primam Last observation, 1, 9, 1892, linear scar, the hernia has not recurred

65 T M, aet 33 Very large, direct, inguino-scrotal, traumatic, strangulated hernia Operation, 24, 5, 1892 A gangrenous appendix vermiformis was excised The wound suppurred The patient was discharged, 2, 7, 1892, and cannot now be found

66 T McC, aet 9 Small, left, oblique, inguinal, congenital, irreducible hernia Operation, 27, 5, 1892 The wound healed per primam Last observation, 23, 6, 1892, linear scar

67 E C, aet 23 Right, oblique, inguinal, reducible hernia Operation, 9, 6, 1892. The wound suppurred Discharged, 4, 7, 1892

68 J McN, aet 34 Large, right, oblique, inguino-scrotal, irreducible hernia Operation, 10, 6, 1892 The wound healed per primam Discharged for insolence, 25, 6, 1892 Last observation, 20, 2, 1893, linear scar, perfect result

69 G B, aet 3 Small, left, oblique, inguinal, reducible hernia Operation, 15, 6, 1892 The wound healed per primam except for a minute stitch abscess Discharged, 7, 3, 1892

70 J N W, aet 21 Small, left, oblique, inguinal, reducible hernia Operation, 16, 6, 1892 Wound healed per primam Last observation, 1, 9, 1892, linear scar, perfect result

71 C S, aet 58 Small, right, oblique, inguinal, irreducible hernia Operation, 23, 6, 1892 The wound healed per primam Discharged, 23, 7, 1892

72 M W, aet 45 Small, right, oblique, inguinal, reducible hernia Operation, 5, 7, 1892 The wound healed per primam Last observation, 1, 9, 1892, linear scar

73 H R, aet 25 Very large right oblique, inguino-scrotal, irreducible hernia Operation, 9, 8, 1892 The wound healed per primam except for slight suppuration about one stitch Discharged, 8, 9, 1892, well

74 G S, aet 52 Small, left, oblique, inguinal, reducible hernia Operation, 1, 9, 1892 The wound healed per primam Discharged, 5, 10, 1892, well

75 A B, aet 25 Left, oblique, inguinal, strangulated hernia Operation, 6, 10, 1892 The wound healed per primam Discharged 1, 11, 1892

76 W K H, aet 43 Small, left, oblique, inguinal, reducible hernia Operation, 29, 11, 1892 The wound healed per primam Discharged, 27, 12, 1892

77 C C, aet 22 Large, right, oblique, inguino-scrotal, reducible hernia Operation, 13, 12, 1892 The wound healed per primam Discharged, 18, 1, 1893

78 A E, aet 5 Small, right, oblique, inguinal, reducible hernia A recurrence after McBurney's operation in four months Operation, 5, 12, 1890 The wound healed per primam Last observation, 6, 4, 1892, the hernia has not recurred

79 C M S, aet 50 Large, right, femoral, strangulated hernia Operation, 25, 12, 1892 Typical healing

80 B D, aet 22 Large, left, oblique, inguinal, reducible hernia Operation, 13, 1, 1893 Typical healing

81 J G, aet 59 Very large, right, oblique, inguinal, reducible hernia Operation, 10, 1, 1893 The wound healed per primam

82 M L, aet 2 Large, right, oblique, inguinal, strangulated hernia Operation, 29, 1, 1893 Typical healing

The time has come when one may operate upon almost every case of hernia not only without danger to the patient, but also

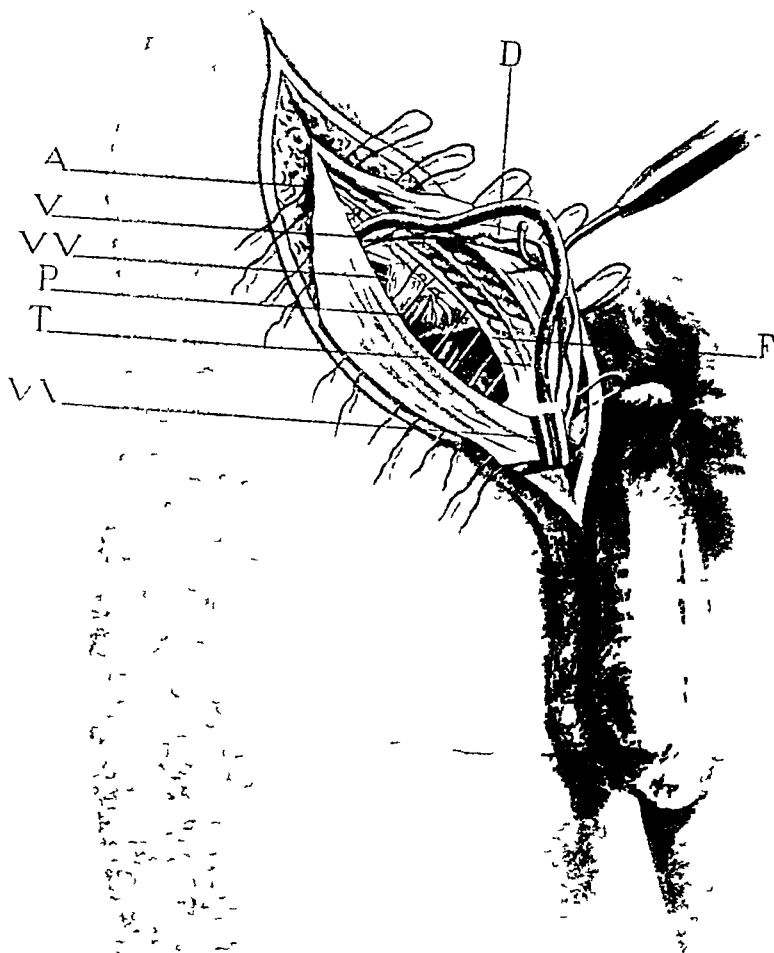
with an almost certain prospect of success Those who with Bull have dropped the term "cure" may take it up again That the mortality is practically nothing one may convince himself from the latest statistics

Svensson and Edman had from 106 cases one death from enteritis and nephritis on the tenth day when the wound was perfectly healed McEwen operated 98 times for the cure of inguinal hernia, from 1879 to 1890 The only fatal case was that of a boy three years old who contracted scarlet fever after the operation and died within thirty-six hours Bassini has operated 251 times for non-strangulated hernia by his method, with but one death, and this from pneumonia 15 days after the operation The wound in the fatal case had healed per primam Lucas-Championnière from 111 cases lost one from pneumonia Kocher reports 119 operations for the radical cure of hernia with one death The cause of death was pulmonary embolism 15 days after the operation and when the wound was perfectly healed We have operated 82 times for the radical cure of hernia without a death

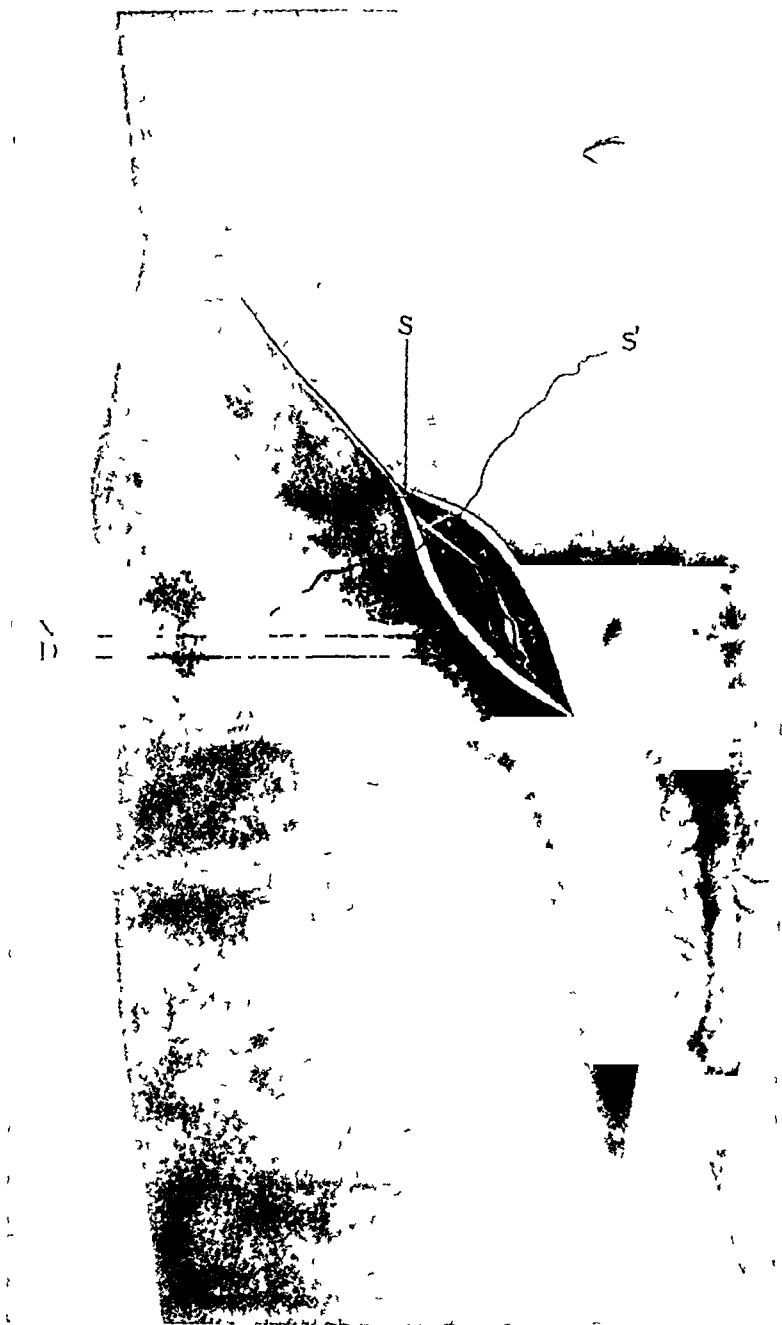
If it is objected that had it not been for the operation none of the deaths above enumerated would have occurred, we cannot positively deny it But it is not improbable, as Kocher cleverly remarks, that if one should keep under observation hundreds of hernia cases of all ages and classes and present them every day with a good dinner, he would occasionally be able to announce a death among them As to the ultimate results I shall refer only to those of McEwen, Bassini and myself McEwen failed but once in 98 cases, and has had several cases under observation for ten years or longer Bassini failed but seven times in 251 cases one hundred and eight cases had been cured for from one to $4\frac{1}{2}$ years, 33 from one year to six months, and 98 from six months to one month In only four cases was the result unknown It is now nearly four years that I have been operating for the cure of inguinal hernia in the manner just described by me, and thus far I have no failure to record, if we exclude the recurrences which I have reported and which could not be ascribed to my method

EXPLANATION OF THE PLATES

- A* Aponeurosis of the external oblique muscle
- D*, Vas deferens
- F*, Fascia transversalis
- P*, Peritoneum
- S*, Buried skin-stitch, tied
- S*, Buried skin-stitch, introduced but not tied
- T*, Conjoined tendon
- V*, Vein
- V*, *V*, Stumps of excised veins









The Results of Operations for the Cure of Cancer of the Breast Performed at the Johns Hopkins Hospital from June, 1889 to January, 1894

BY

WILLIAM STEWART HALSTED, M D

Published in The Johns Hopkins Hospital Reports, 4 297-350, 1894

IN 50 cases operated upon by what we call the complete method we have been able to trace only three local recurrences

Local recurrence is the return of the disease in the field of operation—in the apparent or buried scar. The more extensive, therefore, the operation the more liberal our interpretation of local recurrence. Until it became the custom to remove in every case the contents of the axilla, a local recurrence was understood to be a return of the cancer in the apparent scar, but now that we regularly clean out the infraclavicular and usually the supraclavicular region and remove a part, at least, of the pectoralis major muscle, a return of the disease in any part of the explored regions should be considered a local recurrence. As *regionary recurrence* Billroth designated a return of the cancer in or about the scar "after a long time." Recurrences after so long a time¹ he regarded as growths

¹ The exact time he does not state, but he is inclined to regard a local recurrence after one and one-half years' freedom from the disease as an independent new growth

de novo and as absolutely independent of the original growth To explain these late recurrences he assumes a cancer diathesis, or that conditions favorable to the development of cancer have been furnished by the scar

The great frequency of these late local recurrences and the comparative infrequency of cancer of both breasts makes one hesitate to accept Billroth's explanation of what he terms regionary recurrence However this may be—and I shall revert to the subject later on—I prefer to reserve the term regionary recurrence for the skin metastases at a greater or less distance from the scar When operating for cancer of the breast we cannot be responsible for undiscoverable metastases in the skin (p 298) For the principle growth, the axilla, the pectoral muscles and the supraclavicular region, in other words for the scar in its fullest sense, we should hold ourselves responsible, but for the eradication of the so-called lenticular and apparently discrete metastases of the skin we have no guide One might literally flay the patient's chest and side only to find, a few weeks or months later, one or more cancer nodules in the skin of the neck or back or abdomen

These lenticular skin metastases or regionary recurrences furthermore distinguish themselves from local recurrences in that they are believed to have formed against the lymphatic current and to have no connection either with the parent tumor or with each other

Thanks to the most persistent efforts of my house-surgeon, Dr Joseph C Bloodgood, the result of the operation has been ascertained in all but two cases The two unheard-from cases were classed at the time of the operation with the most favorable ones Only those who have tried it can know what an amount of labor it represents to have traced in this country, and in this part of it, the subsequent histories of such a large percentage of so many cases

Only one of the three local recurrences was inoperable In one, suspicious granulations excised one month after the operation were on microscopical examination pronounced carcinomatous The patient is now perfectly well, without local or regionary

recurrence, 2 years and 3 months after the second operation. The third case developed internal metastases prior to the local recurrence, which latter appeared 2 years after the operation.

In eight cases there has been regionary recurrence (vid tables I and II). Four of these cases are living and four are dead. Of the dead, one, No. 13 (cancer of both breasts), had an inoperable recurrence. Two, Nos. 4 and 12, were operated upon successfully so far as the regionary recurrence was concerned. The fourth case, No. 9, developed cancer of the pleura prior to the regionary recurrence, which latter did not appear until 2 years and four months after the operation. This is the only case of recurrence in the supraclavicular glands. It is classed as a regionary recurrence because, being one of the earlier cases, the supraclavicular region was not explored. Hereafter we shall consider supraclavicular recurrences as local, for we now think it advisable to explore and clean out the supraclavicular (p. 299) region in almost every operable case. Of the four living (vid table II), three, Nos. 35, 40 and 46, have been operated upon for their regionary recurrences and are now well and without recurrence 1 year and 3 months, 11 months, and 3 months respectively after the second operation. One case, No. 41, has operable skin metastases, but has an inoperable carcinoma of the femur.

So far as local and regionary recurrence is concerned the result is known in all but 5 cases. In 34 (73 per cent) of these there has never been a local or regionary recurrence. 24 are living and 10 are dead. In 43 of the 46 cases (93 per cent) there has been no true local recurrence. In other words, there has, as I have said, been a local recurrence in only three cases (6 per cent). These statistics are so remarkably good that we are encouraged to hope for a much brighter, if not a very bright future for operations for cancer of the breast.

The prognosis at the time of the operation was recorded as hopeless or unfavorable in 27 of the 50 cases of complete operation. In every one of the 50 cases some or all of the axillary glands were cancerous. It is stated in the histories of 17 cases that the highest infraclavicular gland was involved. In only 7 cases is it recorded that the highest glands were not involved. In half of

the cases, unfortunately, the historian has neglected to give precise information as to the extent of the involvement of the axillary glands. The subclavicular glands were cancerous in at least 5 (10 per cent) of the cases.

The pectoral muscles may be involved and the prognosis still be good. Volkmann, many years ago, noted the great difference, prognostically, between involvement of the muscle by simple extension of the growth and invasion of the muscle by metastases.

It is probable, as Ludwig says, that cellular elements, when they have once entered the lymphatic vascular system of a muscle, are soon swept along in the lymphatic current by the muscle activity. Hence the extension of the carcinoma into the muscle acquires an accentuated significance. For it is possible that the cancer cells may at any moment be carried with startling rapidity from one end of the muscle to the other. Fortunately the muscle itself is not usually invaded. In Schmidt's report of 226 cases operated upon by Kuster, the tumor was adherent to the underlying parts in only 22 (p. 300) cases. Not one of these cases was cured. But the muscle may be involved when the tumor is not adherent.

In cases of muscle involvement Volkmann has had the best results. But at the time of Sprengel's report only 3 cases in 36 were living, and one of these had internal metastases. I am not quite prepared to announce positively in what proportion of cases we have found the muscle to be involved, but hope to do so in the second part of this paper which will be devoted chiefly to the consideration of the microscopical work. I can say this, however, that the muscle is less frequently involved than I at one time was led to believe from the microscopical examination of what I now regard as an unusual series of cases.¹

¹ Note. In one winter it was my fortune to have three very small cancers of the breast to examine. They were so small that I could mount sections of the entire tumor on the ordinary German form of object-carrier. Two of these cancers had already invaded the muscle. The third had advanced to the muscle, but had been stopped by the pectoral fascia. Six years ago I exhibited before the Clinical Society of Maryland a section of one of these tumors. On this occasion I read a paper before the Society on the cure of breast cancer, and advocated the operation which I have since performed with such gratifying results.

Many years ago Volkmann offered an explanation for the fact that the carcinoma may lie in masses on the muscle and be adherent to its fascia and still not involve the muscle itself. He believed that the lymphatic vessels spread themselves out in the fascia covering the pectoralis major muscle and do not follow the blood-vessels into the connective tissue septa between the muscle bundles, that there is not as a rule a free communication between the lymphatic system of the muscle and that of the fascia covering it. Haidenhain's observations support this theory of Volkmann's, and it is further strengthened, as Haidenhain says, by the physiological investigations of Ludwig and Schweigger-Seidel on the lymphatic vessels of fascia and tendon. These investigators have established the fact that there is an intricate network of lymphatic vessels on the surface of muscle and on the upper side of all fascias. The direction of the lymphatic current is from the muscle to the fascia, and not in the reverse direction. Injections pass readily in the former, but are impossible in the latter direction. So convinced was Volkmann of the accuracy of his observations and of the truth of his theory that he prescribed a method of operating which he followed until his death, and which has been (p. 301) adopted by almost every good surgeon up to the present time. In his *Beitrag zur Chirurgie*, Volkmann wrote as follows: "I make it a rule never to do a partial amputation for cancer of the breast, but remove the entire breast even for the smallest tumors, and at the same time I take away a liberal piece of skin. The skin defect is, of course, very great when one operates in this manner, and the wound, in consequence, requires a long time for healing. Furthermore, in making the lower incision I cut right down to the pectoralis muscle and clean its fibres, as I would for a class-room dissection, carrying the knife parallel with the muscular fasciculi and penetrating into their interstices. The fascia of the muscle, is, accordingly, entirely removed. I was led to adopt this procedure because, on microscopical examination, I repeatedly found when I had not expected it that the fascia was already carcinomatous, whereas the muscle was certainly not involved. In such cases a thick layer of apparently healthy fat separated the carcinoma from the pectoral muscle, and yet the cancerous growth, in places demonstrable only with

the microscope, had shot its roots along the fibrous septa down between the fat lobules and had reached and spread itself out in flat islands in the fascia. It seems to me, therefore, that the fascia serves for a time as a barrier, and is able to bring to a halt the spreading growth of the carcinoma." I quote Volkmann at such length because his operation is a classical one. His observations were accurate, and they have been confirmed in almost every detail by Haidenhain.

With reference to the involvement of the fat, which in greater or less quantity separates the breast from the pectoral muscle, Haidenhain says "I am firmly convinced from what I have seen that carcinomata when they have actually made their way into the lymphatic channels, and such is usually the case, have invariably sent their outposts (Vorposten) at once to the surface of the muscle, no matter what the thickness of the layer of fat between breast and muscle may have been, in other words, that a tumor, however freely movable on the underlying parts, has almost certainly advanced as far as the surface of the muscle." The latter remains, as Volkmann has already observed, entirely healthy for a long time, and this is certainly no less remarkable. In only three of the 18 cases placed by Kuster at Haidenhain's disposition was the muscle invaded by the cancer (p. 302). A glance at the tables which I have made from the records of Bergmann, Billroth, Czerny, Fischer, Gussenbauer, König, Kuster, Lucke and Volkmann should convince one that the operation for the cure of breast cancer, as practiced by the surgeons who have labored the most successfully for the mastery of the disease, is still a very imperfect one.

These tables have been made to determine the percentage of local recurrences after the operation for the cure of breast cancer. I am personally responsible for them, and publish them in full in order that authors who may be surprised at their own results may readily test the accuracy of my figures. The efficiency of an operation is measured truer in terms of local recurrence than of ultimate cure. For some lives are rescued only by repeated operations for local recurrence, and others, free from local recurrence, are lost from internal metastases.

Cures which have been effected by one operation should be

distinguished from those which are the result of several operations, and deaths without local recurrence from those with such recurrence I wish that it had been practicable to separate the true local from the regionary recurrences in all of the tables But the descriptions of the recurrences are sometimes so vague ("Recidiv," "Wiederum, von Carcinom befallen," "Am Ende der Narbe nach dem Sternum zu") that I have not done so Furthermore, the local recurrences are so greatly in excess of the regionary recurrences (of the latter alone there are very few) that it did not seem worth while to attempt to make this distinction

Bergmann had local recurrence in at least 51 per cent, and not improbably in 60 per cent of 114 cases operated upon between the autumn of 1882 and May 1887 I venture to say not improbably, because of 19 patients nothing is known except that they are dead Eight patients whom I have tabulated as having no local recurrence survived the operation only seven and a half months (average time p o) Six cases died in from nine days to two months after the operation

Billroth had local recurrences in 85 per cent of 170 cases, from 1867 to 1876 Vide Table IV

Czerny, in 62 per cent of 102 cases, from 1877 to 1886 Vide Table V

(p 303) Fischer, in 75 per cent of 147 cases, from 1871 to 1878 Vide Table VI

Gussenbauer, in 64 per cent of 154 cases, from 1878 to 1886 Vide Table VII

König, in from 58 to 62 per cent of 152 cases, from 1875 to 1885 Vide Table VIII

Kuster, in 60 per cent of 228 cases, from May 1871 to December 1885 Vide Table IX

Lucke, in 66 per cent of 110 cases, from 1881 to 1890 Vide Table X

Volkman, in 59 per cent of 131 cases, from 1874 to 1878 Vide Table XI

I believe that this is a fair exposition of the best work that has been done in the treatment of cancer of the breast Many of these cases were operated upon before it had become a universal

rule to systematically clean out the axilla. But each of the distinguished surgeons whose results I have tabulated recognized the fact that the axillary glands were usually involved, even when they could not be felt, and had made for himself a rule to explore the axilla in almost every case. Volkmann (Sprengel) and Gussenbauer were perhaps the first to suggest that it might be well to explore the axilla in every case, but Kuster was the first to advocate the systematic cleaning out of the axilla.

Every one knows how dreadful the results were before the cleaning out of the axilla became recognized as an essential part of the operation. Most of us have heard our teachers in surgery admit that they have never cured a case of cancer of the breast. The younger Gross did not save one case in his first hundred. Haynes Agnew stated in a lecture a very short time before his death that he operated on breast cancers solely for the moral effect on the patients, that he believed the operation shortened rather than prolonged life. H. B. Sands once said to me that he could not boast of having cured more than a single case, and in this case a microscopical examination of the tumor had not been made. There are undoubtedly many surgeons still in active practice who have never cured a cancer of the breast. But occasional cures of breast cancer have in all times been observed by reliable surgeons. C. v. Siebold removed the breast and subsequently the contents of the axilla for cancer, and for many (p. 304) years after the second operation had opportunities to see his patient and to convince himself that there was no recurrence of the disease.

Nélaton reports several permanent cures after operation for breast cancer. Velpeau, from 187 women operated upon for breast cancer, knew of seven who had lived for from 5 to 20 years after the operation.

Pauli excised first one breast and then the other for cancer and saw his patient 18 years later.

Encouraged by these rare but positive cures, German surgeons led by Volkmann have for many years been earnestly at work on this problem. But no positive advance in the pathology of breast cancer and no essential improvement in the operation for its cure

has been made since Volkmann's contribution in 1875. Indeed, with one or two uncertain exceptions, there have been no results better than his so far as local recurrence is concerned.

As to ultimate results—permanent cures effected by the operation—we again look to Volkmann and accept, as every one does, but with some modifications, his views as to what shall be called a radical cure. I must quote again the lines which have so often been quoted: "I unhesitatingly make this statement for all cancers, that when a whole year has passed and the most careful examination can detect neither a local recurrence nor swollen glands, nor any symptoms of internal disease, one may begin to hope that a permanent cure may be effected, but after two years usually, and after three years almost without exception, one may feel sure of the result."¹

Billroth² thought that Volkmann expressed himself too cautiously and said "I think that one may express himself more boldly and may declare that if the careful examination of an experienced surgeon detects no recurrence when one year has passed since the operation, one may be sure that there will be neither a local nor glandular recurrence and may pronounce the patient as radically cured." Volkmann prophesied truer, for recurrences after one year are very common. Most surgeons have accepted Volkmann's views and do not consider the disease as radically cured unless three years have passed since the operation. The best results after three years are as follows:

(p. 305) Bergmann (Eichel), 30.2 per cent, Billroth (v. Winivarther), 4.7 per cent, Fisher (Henry), 9 per cent, Gussenbauer (Fink), 16.7 per cent, König (Hildebrand), 22.5 per cent, Kuster (Schmidt), 21.5 per cent, Lucke (Dietrich), 16.2 per cent, Volkmann (Sprengel), 14 per cent.

Volkmann's statistics seem to have some bearing on the question as to the advisability of removing in all cases the pectoralis major muscle. He excised the pectoralis major and with it sometimes the minor in 38 cases. These were his worst cases, cases in

¹ Loc. cit. p. 325.

² Billroth *Krankheiten der weiblichen Brustdrüse*. Handbuch der Chirurgie Billroth & Lücke.

which one or both muscles were involved. They were sometimes hopeless and always more or less desperate. In only eleven of these cases was there recurrence in the scar, in seven there was regionary recurrence, and in thirteen there was neither local nor regionary recurrence. Four died from the effects of the operation. In three cases the result was unknown. Excluding deaths and unknown results (7 cases in all), there was a true local recurrence in only 35 per cent of the cases in which the pectoralis major or major and minor muscles were removed. And in only 58 per cent was there either local or regionary recurrence. Comparing these results with the 60 per cent of local and regionary recurrences in the cases in which the pectoralis muscle was not removed (the milder cases), we are at a loss to explain them unless it be true that the excision of the pectoral muscle or muscles means altogether a more complete operation—a more thorough removal of the fascia at the lower edges of the muscles and between the muscles, and a more radical cleaning out of the infraclavicular region. A large proportion of the recurrences occurred in hopeless cases. The comparatively large percentage of non-recurrence in such desperate cases is remarkable. I wish that there were time to consider the cases in detail. Any one interested in this subject would be rewarded for his labor if he should study these cases in the original.

If we may judge from the incomplete description of the operations, Volkmann is the only one, Billroth perhaps excepted, of the surgeons whose work we have considered who occasionally removed the pectoral muscle. I am at a loss to know how to explain this, for I operate not infrequently on cases in which the disease has involved at least the fat and areolar tissue between the muscles, if not one or both of the pectoral muscles.

(p. 306) Surely no one will question the fact that the comparatively good results in the operative treatment of breast cancer which the Germans are now getting are to be attributed to the systematic and comparatively thorough operation which they perform. But, excluding the great body of surgeons who, the world over, are improving their methods day by day and occasionally curing cases of breast cancer, a thing which they had

never done before, the results of to-day are not very much better than Volkmann's were twenty years ago, if we base our calculations solely on the cases in which at the outset he performed the typical cleaning out of the axilla

But Volkmann's operation is manifestly an imperfect one. It admits of the frequent division of tissues which are cancerous and it does not give the disease a sufficiently wide berth

Even if it were always possible to dissect a delicate layer of fascia (the so-called sheath) from the anterior surface of the pectoralis major muscle, it is surely a dangerous as well as an incomplete procedure whether the sheath is infiltrated with cancer or not. The manipulation of the tissues necessary for this nice dissection must often express cancer cells from the alveoli and lymphatic vessels even if one should be so fortunate as not to cut through the diseased tissues

Why should we shave the under-surface of the cancer so narrowly if the pectoralis major muscle or a part of it can be removed without danger and without causing subsequent disability, and if there are positive indications for its removal?

THE PECTORALIS MAJOR MUSCLE, ENTIRE OR ALL EXCEPT ITS CLAVICULAR PORTION, SHOULD BE EXCISED IN EVERY CASE OF CANCER OF THE BREAST, BECAUSE THE OPERATOR IS ENABLED THEREBY TO REMOVE IN ONE PIECE ALL OF THE SUSPECTED TISSUES

THE SUSPECTED TISSUES SHOULD BE REMOVED IN ONE PIECE (1) LEST THE WOUND BECOME INFECTED BY THE DIVISION OF TISSUES INVADED BY THE DISEASE, OR OF LYMPHATIC VESSELS CONTAINING CANCER CELLS, and (2) BECAUSE SHREDS OR PIECES OF CANCEROUS TISSUE MIGHT READILY BE OVERLOOKED IN A PIECEMEAL EXTIRPATION

(p 307) The operation which has been attended with such surprisingly good results in our hands is performed as follows

1 The skin incision is carried at once and everywhere through the fat

2 The triangular flap of skin, ABC (vide Plate X), is reflected

back to its base line, CA There is nothing but skin in this flap The fat which lined it is dissected back to the lower edge of the pectoralis major muscle where it is continuous with the fat of the axilla

3 The costal insertions of the pectoralis major muscle are severed, and the splitting of the muscle, usually between its clavicular and costal portions, is begun, and continued to a point about opposite the scalenus tubercle on the clavicle

4 At this point the clavicular portion of the pectoralis major muscle and the skin overlying it are cut through hard up to the clavicle This cut exposes the apex of the axilla

5 The loose tissue under the clavicular portion (the portion usually left behind) of the pectoralis major is carefully dissected from this muscle as the latter is drawn upwards by a broad, sharp retractor. This tissue is rich in lymphatics, and is sometimes infiltrated with cancer (an important fact)

6 The splitting of the muscle is continued out to the humerus, and the part of the muscle to be removed is now cut through close to its humeral attachment

7 The whole mass, skin, breast, areolar tissue and fat, circumscribed by the original skin incision is raised up with some force, to put the submuscular fascia on the stretch as it is stripped from the thorax close to the ribs and pectoralis minor muscle It is well to include the delicate sheath of the minor muscle when this is practicable

8 The lower outer border of the minor muscle having been passed and clearly exposed, this muscle is divided at right angles to its fibers and at a point a little below its middle

9 The tissue, more or less rich in lymphatics and often cancerous, over the minor muscle near its coracoid insertion is divided as far out as possible and then reflected inwards in order to liberate or prepare for the reflection upwards of this part of the minor muscle

10 The upper, outer portion of the minor muscle is drawn upward (vid Plate XI) with a broad sharp retractor This liberates the (p 308) retractor which until now has been holding back the clavicular portion of the pectoralis major muscle

11 The small blood-vessels (chiefly veins) under the minor muscle near its insertion must be separated from the muscle with the greatest care. These are imbedded in loose connective tissue which seems to be rich in lymphatics and contains more or less fat. This fat is often infiltrated with cancer. These blood-vessels should be dissected out very clean and immediately ligated close to the axillary vein. The ligation of these very delicate vessels should not be postponed, for the clamps occluding them might of their own weight drop off or accidentally be pulled off, or the vessels themselves might be torn away by the clamps. Furthermore, the clamps, so many of them, if left on the veins, would be in the way of the operator.

12 Having exposed the subclavian vein at the highest possible subclavicular point, the contents of the axilla are dissected away with scrupulous care, also with the sharpest possible knife. The glands and fat should not be pulled out with the fingers, as advised, I am sorry to say, in modern textbooks and as practiced very often by operators. The axillary vein should be stripped absolutely clean. Not a particle of extraneous tissue should be included in the ligatures which are applied to the branches, sometimes very minute, of the axillary vessels. In liberating the vein from the tissues to be removed it is best to push the vein away from the tissues rather than, holding the vein, to push the tissues away from it. It may not always be necessary to expose the artery, but I think that it is well to do this. For sometimes, not usually, the tissue above the large vessels is infiltrated. And we should not trust our eyes and fingers to decide this point. It is best to err on the safe side and to remove in all cases the loose tissue above the vessels and about the axillary plexus of nerves.

13 Having cleaned the vessels, we may proceed more rapidly to strip the axillary contents from the inner wall of the axilla—the lateral wall of the thorax. We must grasp the mass to be removed firmly with the left hand and pull it outwards and slightly upwards with sufficient force to put on the stretch the delicate fascia which still binds it to the chest. This fascia is cut away close to the ribs and serratus magnus muscle

(p 309) 14 When we have reached the junction of the posterior

and lateral walls of the axilla, or a little sooner, an assistant takes hold of the triangular flap of skin and draws it outward, to assist in spreading out the tissues which lie on the subscapularis, teres major and latissimus dorsi muscles. The operator having taken a different hold of the tumor, cleans from within outwards the posterior wall of the axilla. Proceeding in this way, we make easy and bloodless a part of the operation which used to be troublesome and bloody. The subscapular vessels become nicely exposed and caught before they are divided. The subscapular nerves may or may not be removed, at the discretion of the operator. Kuster lays great stress upon the importance of these nerves for the subsequent usefulness of the arm. We have not as yet decided this point to our entire satisfaction, but I think that they may often be spared to the patient with safety.

15 Having passed these nerves, the operator has only to turn the mass back into its natural position and to sever its connection with the body of the patient by a stroke of the knife from b to c, repeating the first cut through the skin.

All that has been removed is in one piece (vid. Plates XI, XII and XIII). There are no small pieces nor shreds of tissue. I believe that we should never cut through cancerous tissues, when operating, if it is possible to avoid doing so. The wound might become infected with cancer either by the knife which has passed through diseased tissue and perhaps carries everywhere the cancer-producing agents, or by the simple liberation of the cancer cells from their alveoli or from the lymphatic vessels. The division of one lymphatic vessel and the liberation of one cell may be enough to start a new cancer.

This may explain some or all of the very late (from 3 to 5 or even more years) local recurrences which are not rarely met with. It is a more plausible theory, I think, than that offered by Billroth, of a cancer diathesis and that conditions favorable to the development *de novo* of cancer are furnished by the scar. If the explanation which I suggest is the correct one, we should expect to find these very late recurrences somewhere in the field of operation rather than as lenticular metastases in the skin. And such is really the case. I have found thus far no positive instance

of recurrence as late as three years which was not in the scar in its broad sense. Of 15 cases of recurrence after three years, not one is reported as having taken (p. 310) place primarily in the skin. One case (Gussenbauer, case 71), the only one which might be construed as a late recurrence in the skin, was already an inoperable cancer *en cuirasse* when observed by the surgeon 3 years after the operation, and may have been an early and not a late recurrence.

Another argument in favor of this theory of inoculation is the following. When carcinomata have once begun to grow rapidly they continue to do so. The pace, if I may use the term, increases rather than decreases as the growth advances. The metastases of rapidly growing carcinomata also increase rapidly in size, they seem to take the pace of the parent growth, although this is not invariably the case. We can readily understand why there should be exceptions to this rule. The metastasized cells may have the full virulence of the home cells, but may not at once find the conditions so favorable for their development.

The early local recurrence is probably always an uninterrupted growth so far as place is concerned, a direct continuation of the parent growth or its metastases. It makes its appearance very soon after the operation, and grows as fast as, or faster than it was growing at the time of the operation. The lenticular metastases in the skin may appear in great numbers in a very short time, but the individual nodule grows slowly and seldom attains a large size. The skin seems to offer a certain resistance to the growth of the cancer. Whether it does or does not offer this resistance, might we not expect to find these so-called late recurrences, occasionally at least, in the skin if they are always continuous growths? Consulting again our tables, we find that primary recurrences in the skin rarely, if ever, make their appearance as late as one year after the operation.

The operation, as we perform it, is literally an almost bloodless one. From the first to the last each bleeding point is stopped with an artery forceps as quickly as possible. When practicable the vessels are clamped before they are divided. If no blood is lost there is no perceptible shock from the operation. This is

true of almost every operation The symptoms which are so often ascribed to shock are due almost invariably to loss of blood I have performed this operation for breast cancer on patients whose pulse before the operation was so feeble that the anesthetizer and bystanders have pronounced it barely perceptible As a rule the pulse is little if any feebler after the operation than it was before it

(p 311) The edges of the wound are approximated by a buried, purse-string suture of strong silk Of the triangular flap of skin (abc) only the base is included in this suture The rest of this flap is used as a lining for the fornix of the axilla The apex of this flap is consequently shifted to a new and lower position The axilla is never drained and invariably heals by first intention The uncovered wound often heals by the so-called organization of the blood-clot

76 operations (complete and incomplete) for breast cancer have been performed in the hospital and not one death has resulted from the operation

26 incomplete operations have been performed 7 were incomplete because of the small size and recent appearance of the tumor 4 of these are living, 1 with a local recurrence 2 died with metastases—one and perhaps both with local recurrence¹

19 operations were incomplete because of the magnitude of the growth and the hopelessness of the case These operations were undertaken for the moral effect upon the patient, and were usually little more than an ablation of the greater part of the new growth

As to the disability produced by the operation, it has in some cases been so slight as to be absolutely inappreciable In most cases the arm of the side operated upon has been quite as useful as before the operation Some of the patients when questioned complain that they cannot dress their back hair This disability is due to the loss of skin and not to the loss of muscle The cicatrix sometimes prevents the patient from raising the arm high

¹ The 7 incomplete operations probably furnished as many (3) local recurrences as the 50 complete operations

enough to dress the back of the head We have twice relieved this trouble by skin grafting In no case that I know of has the disability of which the patient complained been due to the excision of the muscle or muscles Occasionally there has been temporary swelling of the extremity

If we permitted the arm to become glued to the side—and this would often happen if we did nothing to prevent it—there would be disability from fixation We are careful therefore to secure a high axillary fornix This is accomplished by means of the triangular flap of skin (abc) which is devoted almost entirely to this purpose, and which is held in place by a carefully applied dressing After all, disability, ever so great, is a matter of very little importance as compared with the life of the patient

(p 312) Furthermore, these patients are old Their average age is nearly 55 years They are no longer very active members of society We should, perhaps, sacrifice many lives if we were to consider the disability which might result from removing a little more tissue here and there

I sometimes ask physicians who regularly consult us why they never send us cancers of the breast They reply, as a rule, that they see many such cases but supposed that they were incurable We rarely meet a physician or surgeon who can testify to a single instance of positive cure of breast cancer The conscientious physician could not under the circumstances advise his patient to be operated upon, and he was justified in treating her with salves and internal remedies But now we can state positively that cancer of the breast is a curable disease if operated upon properly and in time I cannot emphasize too strongly the fact that internal metastases occur very early in cancer of the breast, and this is an additional reason for not losing a day in discussing the propriety of an operation

Surgeons should practice this operation on the cadaver It is not an operation that can be properly performed after two or three trials We operate for cancer of the breast better now than we did last year, and we operated better last year than five years ago I have not had a local recurrence for more than three years

Now that surgery is specialized to such an extent, surgeons

have plenty of time to drill themselves in operating. They should not case about for easy operations—for operations that any one can do at any time and in any place. I think that surgeons will some day contemplate with astonishment some of the handy, happy-go-lucky methods for intestinal suture which are now so much in vogue.

¹ Case 1 (Surgical No 12)—L S, aet 38 Married 10 children. Menstruation on decline. Tumor of left breast for six months. Pain in breast and arm for two or three months. The tumor now occupies the entire breast and is adherent to the pectoral muscle. The nipple is retracted. There is a large abscess in the axilla—28, 5, 1889, abscess in axilla opened—14, 6, breast and part of the major pectoral muscle excised, axilla not cleaned out at this time because of suppurating wound—21, 7, excision of scar, remainder (p 313) of pectoral muscle and axillary contents, which latter were very adherent to vessels. The glands of the axilla were carcinomatous. Very unfavorable case. Discharged in two weeks, wound healing well—5, 11, 89, granulating area excised and grafted with skin. No local nor regionary recurrence when last observed, one year after first operation. Lived about $1\frac{1}{2}$ years. Died of cancer of the other breast.

Case 2 (Surg No 177)—M J J, aet 39 Married 8 children. Menstruation more profuse and frequent since appearance of tumor. Cancer of left breast for five months. Growth has been very rapid during the last four weeks. Pain for four months in the affected breast. Now the pain is also in the axilla, shoulder and arm—15, 10, 1889, complete operation. Favorable case. Discharged in five weeks with healthy granulating wound. Lived three years and three months. Cause of death unknown. Written report says no recurrence.

Case 3 (Surg No 326)—M A, aet 63 Married One child. Menopause at thirty-five. Tumor of left breast observed for four years. Began, says patient, one year after an injury. Five years ago noticed oozing of blood from left nipple, which

¹ I wish to express again my thanks to Dr Bloodgood for the following abstract of the histories

continued for one year Nipple then began to retract and a nodule appeared at its outer side The pains, shooting in character, are sharp, but not constant The tumor is hard and involves the nipple and the skin surrounding it It moves freely on the pectoral muscle The supraclavicular glands have been enlarged for the last two weeks —21, 2, 1890, complete operation Glands in axilla were small, carcinomatous and very hard, but not adherent to the vessels Regarded as favorable case Discharged in three weeks with healthy granulating wound Result unknown. Patient cannot be found

Case 4 (Surg No 360)—E S, aet 53 Married 10 children Menopause three years ago Tumor, size of orange, of left breast for eleven months, attributed to injury Began as small, hard lump in outer hemisphere Pain for past week only It resembles the pain of a needle prick The nipple is not retracted Skin not adherent Tumor freely movable over muscle Axillary glands cannot be felt —11, 3, 1890, complete operation Glands in axilla hard and small, but not adherent to the vessels Considered favorable case Patient discharged in two weeks with healthy granulating wound (p 314)—6, 7, 1892 (two years and four months after the operation), regionary recurrence A small nodule in skin on the outer side of the scar, also enlarged supraclavicular glands 2nd operation Glands and nodule excised Wound healed in 3 weeks No local nor regionary recurrence —1, 3, 1894, reported dead

Case 5 (Surg No 385)—M A, aet 27 Married Two children One miscarriage Menstruation normal Has lost flesh of late Cancer of the left breast for nine months Began as nodule in outer hemisphere Rapid growth and much pain in breast and arm for past two months The nipple is involved but not retracted Pressure on breast expresses a rusty-colored fluid from nipple Axillary glands enlarged —21, 3, 1890, complete and satisfactory operation Favorable case Discharged in four weeks with healthy granulating wound Died three years and seven months after operation, cause of death unknown

Case 6 (Surg No 388)—S C D, aet 60, Widowed Menopause at 47 Two children One miscarriage Has pulmonary

tuberculosis Two and one-half years ago first noticed an enlargement of outer half of left breast A few months later the nipple became sore A few months ago enlarged glands were noticed in the axilla Since then has had much pain—27, 3, 1890, operation as complete as possible Glands not very large, but matted together and so adherent to the vessels and other parts that a clean dissection was almost impossible Discharged in four and one-half weeks with healthy granulating wound Died in two years and seven months of internal metastasis Letter from friends does not mention local return

Case 7 (Surg No 624)—F A W, aet 53 Married six years Childless Menopause one year ago General health good Tumor of the right breast for four months, following an injury Cancer the size of hen's egg in the outer and upper quadrant of right breast It is freely movable on underlying parts and not adherent to skin The nipple is retracted A few small hard glands are to be felt in the axilla—6, 9, 1890, complete operation Glands in axilla are imbedded in large amount of apparently healthy fat Prognosis very favorable Discharged in three weeks with healthy granulating wound—10, 11, 1890, wound is healed—March, 1894 (three years and seven months after operation), patient enjoys best (p 315) of health No signs of recurrence Small painless cicatrix There is no swelling of the arm and patient has good use of it

Case 8 (Surg No 650)—K B, aet 39 Married 12 years One child Menstruation regular Tumor of left breast for three months Cyst size of hen's egg in upper and inner quadrant of left breast, 4 cm to left of sternum It is freely movable under skin on underlying parts Nipple not retracted Axillary glands not palpable—2, 10, 1890, cyst excised On microscopical examination the walls of the cyst proved to be carcinomatous—11, 10, 1890, complete operation Patient discharged in two weeks with healthy granulating wound—March, 1894 (three years and six months after operation), patient in excellent health, no signs of recurrence Good use of arm

Case 9 (Surg No 691)—V U, aet 40 Married six children Menstruation normal General health good Tumor

of left breast for three months, appearing, says patient, two days after an injury When first observed was the size of a hickory nut Growth has been gradual and without pain Cancer the size of a walnut, freely movable on underlying parts Skin not adherent Nipple not retracted—10, 31, 90, complete operation except for supraclavicular glands Glands below clavicle involved Prognosis almost absolutely bad—18, 11, 1890, granulations excised and skin grafted to hasten healing Discharged in five weeks with wound entirely healed—April, 1892, well No return in scar or axilla, but supraclavicular glands enlarged—March, 1893 (two years and five months after operation), patient in excellent health and spirits—15, 3, 1893, shortness of breath—July, 1893, signs of carcinoma of left lung and pleura, arm and shoulder swollen Skin nodules over right breast and in right axilla No return in scar nor left axilla—Jan., 1894, three years and two months after operation, died from internal metastasis No local recurrence

Case 10 (Surg No 758)—P H, aet 35 Negress Married 17 years Fourteen children Menstruation normal Abscess in right breast during first lactation General condition good Tumor of right breast for nine months Cancer now occupies entire breast Nipple is retracted Large glands in axilla—12, 12, 90, complete operation Highest axillary and supraclavicular glands involved Prognosis hopeless Discharged in four and one-half (p 316) weeks with healthy wound Died with symptoms of internal metastasis in seven months Neither local or regional recurrence

Case 11 (Surg No 821)—Mrs C, aet 66 Widowed Maternal aunt died with cancer of the breast Abscess in left breast with first lactation Five months ago noticed pain in left breast, and then a tumor Has now a cancer the size of a walnut in the upper and outer quadrant of the left breast It is freely movable on the underlying muscle Nipple slightly retracted Skin not adherent Axillary glands slightly enlarged—27, 1, 1891, complete operation Only a few enlarged glands in the axilla Prognosis at operation favorable Discharged in seven weeks with healthy granulating wound—6, 7, 1891, five months

after the operation, local recurrence Small nodule at edge of scar of left breast Fullness and diffuse induration in right breast, but no glands to be felt in the right axilla Operation Excision of a portion of the right breast for examination Pathological report nodule from scar carcinoma Piece from right breast normal—17, 2, 1892 (one year and one month after the first operation), diffuse recurrence in scar of left breast Carcinoma of stomach Sugar in urine Excision of the recurrence attempted Disease found to involve several of the ribs Died of carcinoma of stomach in about one and one-half years after first operation

Case 12 (Surg No 978)—M Z, aet 62 Married Eight children General health not good Somewhat emaciated Four years ago noticed three "pimples" under left nipple, which enlarged and ulcerated one year ago Cancer now occupies center of left breast Nipple ulcerated Glands can be felt in axilla—15, 5, 1891, complete and satisfactory operation Prognosis favorable Discharged in four weeks with healthy granulating wound—20, 10, 1891 (five and one-half months after operation), regional recurrence Small nodule in skin on the outer side of scar No return in scar or axilla Nodule excised Reported dead Cause and time (?) of death unknown No mention of recurrence

Case 13 (Surg No 1109)—J J, aet 35 Married Menstruating Cancer of both breasts One year ago patient detected painless nodule in left breast She had not noticed the nodule in her right breast The left breast is uniformly enlarged Skin is adherent Nipple retracted Tumor movable on pectoral muscle In the right breast is a small nodule Skin not adherent to it Nipple not retracted Glands (p 317) in both axillae enlarged—6, 8, 1891, complete and satisfactory operation on left side—25, 9, 1891, complete operation on right side Satisfactory dissection Discharged 15, 11, 1891 No recurrence in wound or axilla, but skin metastases on both sides of chest—July, 1892 (eleven months after first operation), numerous metastases in skin of chest Some ulcerating General health quite good No recurrence in scar nor axillae Four inoculations with

pure culture of the streptococcus of erysipelas with negative results

Case 14 (Surg No 1123)—A W, aet 59 Colored Widowed Thirty years ago patient noticed painless lump in left breast Two years ago the tumor began to grow perceptibly. Since then patient has had intermittent pain in breast The cancer is movable on the muscle Skin adherent Nipple retracted—13, 8, 1891, complete operation Part of pectoralis minor removed Highest gland in axilla involved Prognosis unfavorable No nodules in muscle discoverable by microscope—March, 1894 (two years and six months) patient in good health No local or regionary recurrence

Case 15 (Surg No 1180)—F H E, aet 41 Married Two children Two miscarriages Youngest child ten years old One year ago lump noticed in upper hemisphere of left breast Pain during last ten days in breast and left shoulder, three weeks ulcerated Cancer, ulcerated, size of hen's egg, freely movable on muscle, but adherent to skin Small glands to be felt in left axilla—16, 9, 1891, complete operation Prognosis very unfavorable Discharged in four weeks Patient died a few weeks after reaching home No local nor regionary recurrence

Case 16 (Surg No 1246)—J J S, aet 45 Married Seven children Two miscarriages Menstruation regular Five years ago noticed small lump below right nipple Pain for the last three months, intermittent, darting Cancer below right nipple, size of a marble, tender, freely movable on pectoralis major muscle Nipple retracted Skin adherent Axillary glands not palpable—22, 10, 1891, complete operation A few carcinomatous glands in axilla Prognosis favorable Microscopical examination The cancer is a circumscribed one A few epithelial masses in axillary glands Patient discharged in four and one-half weeks—March, 1894 (two years and five months after operation), patient is perfectly well Has no local nor regionary recurrence

(p 318) Case 17 (Surg No 1248)—E McG, aet 49 Widowed Seven children One miscarriage Menstruation regu-

lar Tumor above nipple of left breast for two years For one year intermittent pains, ulceration of skin over tumor and retraction of nipple Cancer 4 x 6 cm in outer and upper quadrant of left breast Movable on pectoralis muscle, but adherent to skin Axillary glands enlarged—22, 10, 1891, complete operation Highest axillary gland involved Nodule the size of a pea in the major pectoral muscle No local nor regional recurrence for two years Then return in scar Died of internal metastases two years and four months after operation

Case 18 (Surg No 1255)—E E, aet 54 Married Four children Youngest child twenty-six years old Menopause four years ago Five years ago patient noticed tumor of right breast She attributes it to an injury sustained six years ago Patient has a cancer in the upper and outer quadrant of the right breast The nipple is retracted The axillary glands are enlarged—27, 10, 1891, complete operation The highest gland of axilla is involved Prognosis unfavorable In four weeks a suspicious spot developed in the wound This and the surrounding granulations were promptly excised The microscopical examinations of the suspected granulations proved them to be carcinomatous—March, 1894 (two years and four months after the operation), patient is very well and has good use of the arm There is no local nor regional recurrence

Case 19 (Surg No 1337)—J E T, aet 62 Married No children Menopause several years ago Forty-six years ago noticed small lump in the left breast, which caused no discomfort until two years ago, when it began to grow and to become painful The entire left breast is now involved, but it is freely movable on the pectoral muscle In the upper and outer quadrant of the breast is a mass of bony hardness The axillary glands are palpable—15, 12, 1891, complete operation The highest infraclavicular gland was involved Prognosis unfavorable On examination of the excised breast a calcified fibroma is found near the outer edge of the tumor Patient died in twenty-one months without local or regional recurrence

Case 20 (Surg No 1359)—Aet 37 Married three years No pregnancies Menstruation irregular Five weeks ago

noticed nodule below left nipple Has sharp intermittent pains
Cancer 2 x 5 cm below and to inner side of nipple, freely movable
on (p 319) pectoral muscle and not adherent to skin Nipple
not retracted Axillary glands not palpable—29, 12, 1891,
complete operation Highest infraclavicular gland enlarged
Prognosis unfavorable Discharged in two weeks—March,
1894 (two years and two months after operation), well No
local nor regionary recurrence

Case 21 (Surg No 1393)—M E D, aet 42 Married.
Thirteen children Menstruation regular Youngest child one
year old Four months ago noticed small, painful lump above
left nipple The pain has steadily increased The cancer now
involves most of the breast, is movable on the pectoral muscle
and not adherent to the skin The nipple is not retracted One
gland can be felt in the axilla—19, 1, 1892, complete operation
Highest infraclavicular gland involved Prognosis unfavorable
Microscopical examination Adeno-caicinoma of breast and
microscopic metastases in glands—July, 1892 (six months after
operation), well—April 27, 1894, patient presents herself for
examination Is perfectly well No local nor regionary recur-
rence Good use of arm

Case 22 (Surg No 1429)—E T O, aet 60 Widowed
Five children Three miscarriages Menopause five years ago
Has had a lump in left breast for forty years which has given her
no trouble until five months ago Then noticed nodules in left
axilla and below left breast Eight weeks ago the latter became
ulcerated and the nipple became retracted Patient has had no
pain Has a cancer the size of a walnut in the outer hemisphere
of the left breast The skin is inflamed and adherent to the
tumor There are regionary metastases in the skin from the
nipple to the axilla The glands of axilla are enlarged—11, 2,
1892, complete operation The pectoralis minor muscle was
removed The highest infraclavicular glands were involved and
there were cancerous nodules in the pectoralis major muscle
Discharged in four weeks with healthy granulating wound—
June, 1892, necrosed rib excised at bottom of small granulating

wound—August, 1892 (six months after operation), died of internal metastases No local nor regional recurrence

Case 23 (Surg No 1532)—S A L, aet 64 Married Four children Menopause twelve years ago One year ago a small lump, accompanied by darting intermittent pains, appeared in the left breast Nine months ago the nipple became retracted and the pain became great in the axilla Cancer in outer hemisphere of left (p 320) breast, size of an egg, hard, movable on muscle and not adherent to skin A few small hard glands can be felt in the axilla—1, 4, 1892, complete operation Highest infraclavicular gland involved Prognosis unfavorable Discharged in two weeks—March, 1894 (one year and eleven months after the operation), well Almost perfect use of arm No local nor regional recurrence

Case 24 (Surg No 1560)—M F, aet 42 Married Menstruation normal Eighteen months ago, at end of last lactation, had pain in right breast Then noticed lump under skin Has cancer now size of an orange, hard, adherent to skin and to pectoral muscle Nipple retracted Enlarged glands in axilla—21, 4, 1892, complete operation Prognosis hopeless Died in eleven months (Local ret ?)

Case 25 (Surg No 1635)—M C, aet 56 Widowed Six children Eight months ago noticed lump in skin in left axillary line, which ulcerated three months later, following application of caustic Cancer 12 x 9 cm Ulcer 6 x 3 cm Axillary glands enlarged—31, 5, 1892, complete operation Prognosis unfavorable Pectoral muscle not involved—March, 1894 (one year and ten months after operation), well No local nor regional recurrence Good use of arm, which is somewhat swollen

Case 26 (Surg No 1676)—A J A, aet 54 Widowed Four months ago noticed tumor size of walnut, just above nipple Skin is adherent Nipple retracted Axillary glands palpable—21, 6, 1892, complete operation Prognosis favorable—March, 1894 (one year and nine months after operation), well, good use of arm No swelling of arm No local nor regional recurrence

Case 27 (Surg No 1677) —E McC, aet 61 Married A few weeks ago noticed pain and a small lump in left breast Cancer the size of a pigeon's egg, movable on pectoral muscle, adherent to skin Nipple retracted Axillary glands enlarged —21, 6, 1892, complete operation Prognosis favorable Patient not heard from since discharged

Case 28 (Surg No 1710) —L S, aet 66 Married Three weeks ago noticed a small painless nodule in left breast Has cancer in upper and outer quadrant of left breast It is hard and adherent to skin, but movable on pectoralis major muscle The nipple is retracted The axillary glands are not palpable —15, 7, 1892, complete (p 321) operation Prognosis favorable. The highest infraclavicular glands were cancerous, but very small The pectoral muscle was not invaded by the cancer —March, 1894 (one year and seven months after the operation), well Good use of arm Chops wood with it No local nor regionary recurrence

Case 29 (Surg No 1718) —C B K, aet 62 Widowed One child Abscesses in both breasts during lactation thirty years ago Four months ago noticed soreness in left nipple, and a few days later a lump above the nipple Cancer, now the size of a duck's egg, chiefly below but embracing nipple Movable on muscle Nipple retracted and fissured Bleeds easily A large mass of glands in the axilla —16, 7, 1892, complete operation Prognosis favorable as to local recurrence Died in ten months from internal metastases No local nor regionary recurrence

Case 30 (Surg No 1729) —M S J, aet 60 Negress Widowed Two children Menopause twenty years ago Four months ago noticed shooting pains and tumor in right breast One month ago the skin ulcerated at the inner side of the nipple The cancer now occupies the entire breast It is hard and not freely movable on muscle There is an excavated ulcer one inch to the inner side of the nipple Large hard glands to be felt in the axilla —29, 7, 1892, complete operation The highest infraclavicular gland is involved Prognosis very unfavorable —

Dec 1893 (one year and five months after operation), well No local nor regionary recurrence Good use of arm

Case 31 (Surg No 1736) —J S, aet 60 Married Nine children Two years ago pain in right breast and shoulder Breast was swollen for a short time Pain and swelling disappeared Three months ago pain began in right axilla Three weeks noticed lump in right breast Cancer now occupies outer and lower quadrant of right breast It is ill defined, hard, intimately associated with the gland, movable on the pectoral muscle, and not adherent to the skin The nipple is slightly retracted There is a hard mass of glands in the axilla —5, 8, 1892, complete operation Highest infraclavicular gland involved Tumor adherent to the pectoral major muscle —March, 1894 (one year and seven months after the operation), well No swelling, and good use of arm Soft scar Skin movable on underlying parts No local nor regionary recurrence (p 322) Case 32 (Surg No 1782) —M E C, aet 54 Married Eight children Six miscarriages Menopause five years ago One year ago noticed a small lump in left breast Ulceration supervened very soon Cancer 12 x 13 cm in upper outer quadrant A fungoid mass projects from the ulcer —7, 9, 1892, complete operation Cancer circumscribed Remainder of breast and the pectoral muscle normal Some of the axillary glands show metastases Prognosis favorable as to local recurrence Dead in ten months No local nor regionary recurrence

Case 33 (Surg No 1819) —M H, aet 46 Married One child, ten years old Menopause five years ago One year ago noticed nodule size of a pea in the right breast Growth of tumor has been slow Five months ago the skin became adherent and discolored Six weeks ago the skin ulcerated Has had intermittent pains from the beginning Cancer 6 cm in diameter in the upper hemisphere of right breast It is freely movable on the muscle Axillary glands not palpable —23, 9, 1892, complete operation Axillary glands small, hard and slightly adherent to the vessels Prognosis unfavorable —March, 1894 (one year and five months after the operation), no swelling, and good use of

arm Patient works hard Has no local nor regionary recurrence

Case 34 (Surg No 1835)—M McA, aet 50 Married Three years ago noticed lump near right nipple Ulceration began four months ago Cancer now occupies the center of the right breast, below the nipple There is an ulcerating area at the outer side of the nipple from which projects a fungoid mass The axillary glands are enlarged—30, 9, 1892, complete operation The minor pectoral muscle also removed Glands very adherent to the vessels Clean dissection Prognosis unfavorable Died in three and one-half months after the operation No local nor regionary recurrence

Case 35 (Surg No 1875)—E Z, aet 69 Married Four children Youngest 38 years Three months ago noticed a small nodule in the left breast No pain Rapid growth Cancer 2 x 3 cm in upper and outer quadrant of left breast. It is nodular, freely movable on the pectoral muscle, but adherent to the skin Nipple slightly retracted A few glands to be felt in the axilla—27, 10, 1892, complete operation Highest infra-clavicular gland involved. Prognosis unfavorable Discharged in four weeks—January, 1894 (p 323) (thirteen months after the operation), died of internal metastases No swelling, and good use of arm. No local nor regionary recurrence

Case 36 (1903)—Aet 59 Married Seven children Eight months ago noticed a small nodule in the left breast Tumor has grown very little since first noticed Patient has had very little pain Cancer in upper and outer quadrant of left breast, adherent to skin A few small glands to be felt in the axilla—8, 11, 1892, complete operation Prognosis favorable Discharged in four weeks—January, 1894 (thirteen months after the operation), died of internal metastases No swelling, and good use of arm No local nor regionary recurrence

Case 37 K A, aet 34 Married Two children Youngest child eight years old Menstruation regular. Seven months ago patient noticed two small lumps not larger than beans in the upper part of the right breast The tumors have been enlarging

slowly For the past three months the patient has had sharp intermittent pains in the right breast There is a small tumor 3 cm in diameter above the right nipple The nipple is not retracted and the tumor is freely movable under the skin and on the muscle One small gland is to be felt in the axilla—27, 2, 93, complete operation The history says that the pectoralis major muscle was divided but not removed Inasmuch, however, as not a trace of the muscle is to be felt, I conclude that the historian must have made a mistake and that the operation was a complete one—3, 5, 1894, patient presents herself for examination She is perfectly well and has good use of the right arm There is no local nor regionary recurrence, one year and two months after the operation

Case 38 (Surg No 2070)—L B, aet 46. Two years ago noticed small nodule in the right breast Slow growth Pains moderate and intermittent for the last six months Cancer in the upper hemisphere of the right breast the size of a pigeon's egg It is hard, nodular, freely movable on the pectoral muscle and not adherent to the skin Nipple retracted A few small hard glands to be felt in the axilla—21, 2, 1892, complete operation Prognosis favorable Discharged in five weeks with healthy granulating wound—March, 1894 (one year after the operation), well Good use and no swelling of arm No local nor regionary recurrence

(p 324) Case 39 (Surg No 2107)—M Y, aet 46 Married 17 years ago noticed very hard lump in the right breast At first there were shooting and intermittent pains There are none now Retraction of the nipple began three months ago Cancer of the right breast occupies half of the outer hemisphere It is movable on the pectoral muscle, but very adherent to the skin Nipple retracted Very large glands to be felt in the axilla—16, 3, 1893, complete operation The highest infraclavicular glands are involved Prognosis unfavorable Discharged in five weeks—March, 1894 (one year after the operation), well No swelling, and good use of arm No local nor regionary recurrence

Case 40 (Surg No 2166)—S C S, aet. 43. Married Five

years ago noticed a small lump in left breast which was painful on pressure For two years the growth was very slow For the last year the growth has been very rapid A severe pain extends down the arm For the last few months has not been able to lift the arm Cancer now occupies the entire left breast It is attached to the pectoral muscle and is adherent to the skin The nipple is retracted Glands to be felt in the axilla—15, 4, 1893, complete operation The highest infraclavicular gland is involved Prognosis unfavorable Discharged in four weeks—29, 11, 1893 (seven months after operation), regionary recurrence Enlarged supraclavicular glands, also skin metastases at the outer side of scar No local recurrence Glands and skin nodules excised—March, 1894, well No local nor regionary recurrence

Case 41 (Surg No 2256)—Mrs O, aet 46 Widowed One child Menstruating Four years ago noticed lump in left breast The growth has been rapid for the last two years Nipple became retracted eighteen months ago Glands to be felt in axilla Large cancer in outer hemisphere of left breast—22, 5, 1893, complete operation Supraclavicular glands removed The highest infraclavicular gland involved Prognosis unfavorable Discharged in seven weeks—September, 1893, complains of pain in the left hip and walks with cane Re-admitted with fracture of femur, probably caused by bone metastases—16, 12, 1893 (seven months after operation), skin metastasis noticed at the outer side of scar Three in skin over shoulder.—March, 1894, the skin metastases have enlarged very little and have increased in number The enlargement (p 325) of the femur continues There is no return in scar, axilla or supraclavicular region No local recurrence The regionary recurrence is easily operable Operation contraindicated by cancer of femur

Case 42 (Surg No 2339)—M P, aet 65 Widowed Seven children Eleven ago months noticed lump in the left breast Pain has been present for six months Small cancer in upper and outer quadrant of left breast Skin not involved Nipple not retracted One small gland to be felt in the axilla Patient says

it has been there for fifteen years —8, 9, 1893, complete operation The highest infraclavicular gland is not involved The breast nodule is circumscribed The remainder of the gland and muscle apparently uninvolved There are microscopic metastases in the axillary glands —March, 1894 (seven months after the operation), well No local nor regionary recurrence

Case 43 (Surg No 2517)—A S, aet 44 Single Two years ago noticed lump outside of right nipple Retraction of nipple observed three months ago Continuous pain from beginning Cancer 5 x 3 cm in the outer and upper quadrant of right breast Adherent to nipple and to skin near nipple Movable on the muscle A few glands to be felt in the axilla —6, 10, 1893, complete operation The highest infraclavicular gland not involved Prognosis favorable —March, 1894 (four and one half months after the operation), no local nor regionary recurrence¹

Case 44 (Surg No 2565)—S G, aet 60 Married Ten children Five years ago injured right breast Three months later a small lump appeared in the upper part of this breast Severe pain extended to the shoulder and down the right arm The cancerous nodule is at the outer border of the breast over the pectoral muscle It is adherent to both skin and muscle The nipple and remainder of breast apparently uninvolved A few small glands can be felt in the axilla —20, 10, 1893, complete operation The pectoralis minor muscle also removed Prognosis unfavorable because of the infiltration of both pectoral muscles —March, 1894 (three months after the operation), well No local nor regionary recurrence

(p 326) Case 45 (Surg No 2594)—P B, aet 40 Colored Widowed Three children Five months ago noticed small lump in the left breast Pain at first, but none now Cancer 5 x 5 cm in upper and outer quadrant of left breast Freely movable on muscle A few small glands to be felt in the axilla —

¹ April 4th, 1894 Recurrence in scar and axilla 6 months after operation —7, 4, 1894, operation for recurrence The axillary recurrence was in a gland near the apex of the axilla and adherent to the axillary vein Neither operation was performed by me.

2, 11, 1893, complete operation Highest infraclavicular gland involved Prognosis unfavorable. Cancerous nodule invades the fascia of the pectoralis muscle—March 15th, 1894 (three and one-half months after operation), well No local nor regionary recurrence

Case 46 (Surg No 2614)—M T, aet 29 Married One child Child four months old Tumor of right breast, noticed two months ago. This breast gives more milk than the other Cystic tumor occupies the upper and inner quadrant of the right breast, which is painful and tender The tumor cannot be outlined from the remainder of the gland Skin and nipple apparently normal Axillary glands not palpable—11, 11, 1893, operation Incision into cyst filled with cheesy serum, resembling sero-pus Piece of the wall excised for examination found to be malignant cystic-adenoma—17, 11, 1893, complete operation Pectoral muscle and axillary glands show no metastasis—6, 12, 1893, small lenticular nodule in skin at lower and outer side of scar Nodule excised—March, 1894, no local nor further regionary recurrence

Case 47 (Surg No 2628)—P S, aet 64, male Twenty years ago injury to breast Has been tender and painful ever since this injury Fifteen years ago noticed nodule near left nipple Has now a cancer about $2\frac{1}{2}$ cm in diameter in the inner and upper quadrant of the left breast Nipple, skin and pectoralis major muscle are involved—16, 11, 1893, complete operation Highest infraclavicular gland not involved Prognosis favorable Microscopical examination Cancer is circumscribed, but invades pectoral fascia and muscle The axillary glands show metastasis Tissue from apex of axilla normal—March, 1894 (three and one-half months after operation), well No local nor regionary recurrence

Case 48 (Surg No 2654)—S M D, aet 43 Married No children Ten months ago noticed tumor of left breast Pain and discomfort for first four months Has now a small, hard cancerous nodule in the inner and upper quadrant of the left breast Breast is movable on muscle Skin slightly adherent

Nipple not retracted (p 327) Numerous miliary skin metastases surrounding nipple A few palpable glands in axilla and above clavicle—20, 11, 1893, complete operation Highest infraclavicular gland not involved Prognosis favorable—March, 1894 (three months after operation), well No local nor regional recurrence

Case 49 (Surg No 2739)—J R, aet 33 Single Menstruation normal One year ago attention drawn to tumor by a rusty-colored serous discharge from right nipple Pain, which began one month ago, now radiates to the right shoulder Small tumor of inner and upper quadrant of right breast It is nodular, freely movable on muscle and not adherent to skin Nipple slightly, if at all, retracted Axillary glands not palpable—12, 9, 1893, operation Excision of a cyst with suspicious wall Microscopical examination of the wall Cystic-adenoma Intra cystic papillomatous growths Here and there earliest stages of carcinoma—2, 2, 1894, complete operation Prognosis is most favorable Only one cancerous gland found in the axilla—March 20, 1894 (two months after the operation), no recurrence This patient has also a myoma of the uterus

Case 50 (Surg No 2791)—E B, aet 54 Married Two children Carcinoma of the cervix uteri removed by vaginal hysterectomy, six months ago Tumor of left breast, noticed four weeks ago Darting pains Cancer in outer hemisphere, size of a hen's egg Freely movable on muscle Very hard and nodular Not adherent to skin Nipple slightly retracted One small, hard gland to be felt in the axilla—2, 2, 1894, complete operation Prognosis very favorable Highest infraclavicular gland not involved—March 20, 1894, no local nor regional recurrence

W S Halsted

1201 Eutaw Place,
April 1, 1894

EXPLANATION OF THE PLATES

PLATE X Diagram showing skin incisions, triangular flap of skin, etc., and triangular flap of fat

PLATE XI Diagram to elucidate PLATE XII M, Major pectoral muscle, m, Minor pectoral muscle, S, Apex of infraclavicular fat below the subclavian vessels, S', Apex of fat above the vessels

PLATE XII Photograph of field of operation, taken just before the final cut which severs from the body the mass which has been extirpated

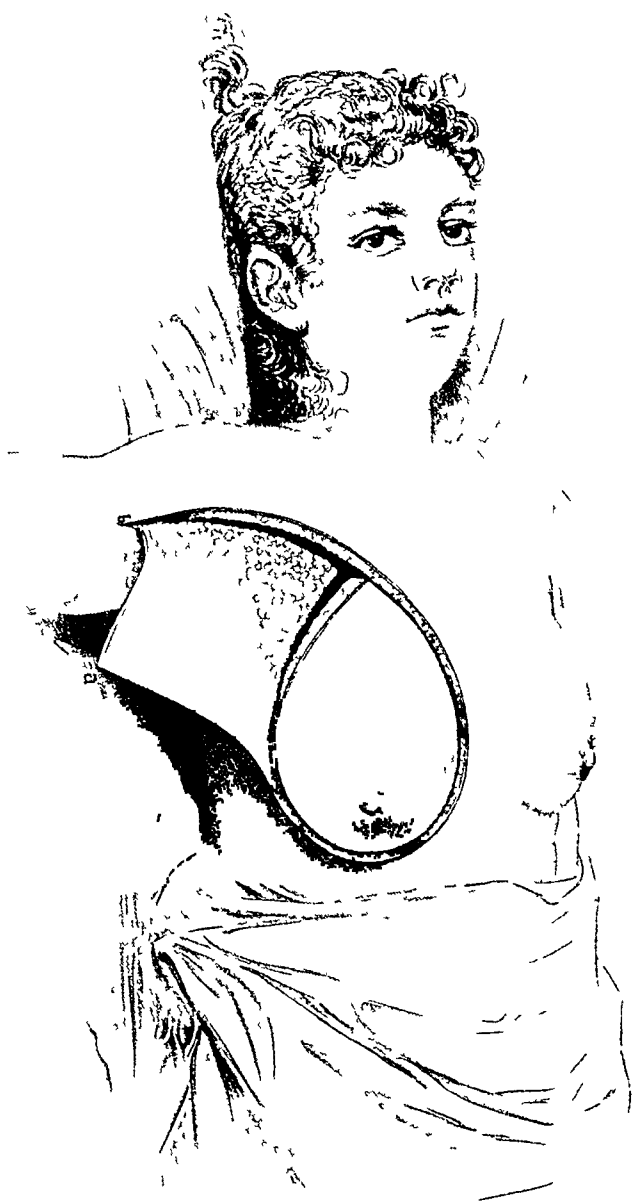
PLATES XIII, XIV AND XV are from photographs of the fresh tissues and show the amount excised in three typical cases of breast cancer

PLATE XIII The glands, although involved, were not surely palpable before the operation

PLATE XIV The skin was so extensively involved and so liberally excised that the subcutaneous tissues removed are almost completely concealed by it The highest axillary and the supraclavicular glands were involved The clavicle was sawed through to insure a more thorough removal of the tissue in which the glands were imbedded

PLATE XV Shows the amount of subcutaneous tissue removed even when the skin is not extensively involved The axillary vein was excised in this case because it was imbedded in tissues infiltrated with cancer

NOTE Plates are numbered as in original publication







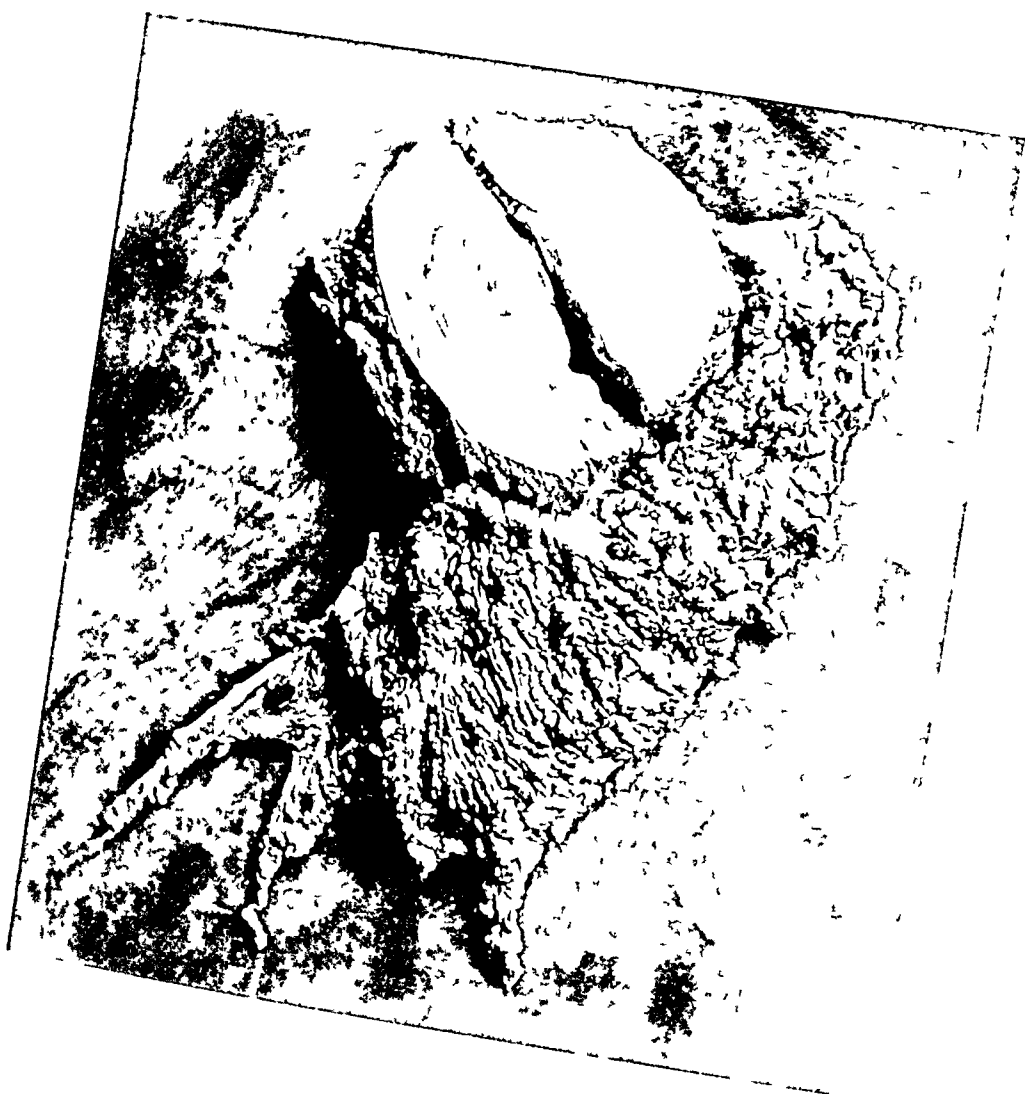


TABLE I

Wm S Halsted, Johns Hopkins Hospital, 1889-94 Fifty Cases

Special No	Surgical No	Local Recurrence 6 Per Cent	Special No	Surgical No	Regional Recurrence
11	821	Scar Five months post-operat Second recurrence hopeless Died carc ventriculi one and a half years	4	360	Skin and suprclav gl two and a third years post operat Excised successfully Four years post-operat reported dead
17	1248	Scar Two years post-operat Nodule in pect major at first operation Died two years and four months, internal metastases	9	691	Suprclavicular glands Lenticular metastases in skin over opposite breast and in opposite axilla two years four months †Three years and two months post-operat
18	1255	Scar One month post-operat Excised successfully Well No recurrence two years and four months post-operat	12	978	One small nodule in skin outer side of scar five and a half months post-operat Excised, presumably successfully Dead No local nor regional recurrence reported
			13	1109	Cancer both breasts Multiple skin nodules one and a half months One year post-operat, no local recurrence
			35	1875	Nodule under skin six months Excised Well No recurrence one year and three months
			40	2166	Skin nodules outside of scar seven months post-operat Excised Well No recurrence eighteen months post operat, eleven months after second operation
			41	2256	Operable skin nodules outside of scar seven months post operat Living Carc femur
			46	2614	Nodule in skin lower and outer side of scar three months post operat Excised Well No recurrence three months after second operation

† Died

TABLE I—*Concluded*

No Local Recurrence						Results as to Local Recurrence Unknown	Special No	Surgical No	Cases Unheard From
Special No	Surgical No	Living	Special No	Surgical No	Living				
7	624	3 yrs 7 mos	1	12	1½ years	5	385	†3 years	Favorable case.
		p o	2	177	3 yrs 6 mos			7 mos	
8	650	3 yrs 6 mos	10	758	7 months	6	388	†2 years	Favorable case
14	1123	2½ years	15	1180	2 months			7 mos	
16	1246	2 yrs 5 mos	19	1337	1 yr 9 mos	24	1560	†11 mos	
20	1359	2 yrs 2 mos	22	1429	6 months				
21	1393	2 yrs 2 mos	29	1718	10 months				
23	1532	1 yr 11 mos	32	1782	10 months				
25	1635	1 yr 10 mos	34	1835	3½ months				
26	1676	1 yr 9 mos	36	1903	13 months				
28	1710	1 yr 7 mos							
30	1729	1 yr 7 mos							
31	1736	1 yr 7 mos							
33	1819	1 yr 5 mos							
37	2064	1 yr 2 mos							
38	070	1 year							
39	107	1 year							
42	2439	7 months							
43	2517	4½ months							
44	2565	3½ months							
45	594	3½ months							
47	628	3½ months							
48	654	3 months							
49	2739	2 months							
50	2791	2 months							

TABLE II

Clinic of Von Bergmann,¹ 1882-87 114 Cases

Local Recurrence, from 51 to 60 Per Cent			Died Soon After the Operation		
No	Situation	Time Post-Operat	No	Cause of Death	Time Post-Operat
35	Scar, axilla, infra- and supraclav gl		51	Carc liver and lungs	2 months
36	(1) Recurrence supraclav	Both soon after operation	56	Carc. pleura	2 "
	(2) Recurrence		85	Cause unknown	2 "
37	Scar in neck, infra- and supraclav glands	1 year 6 mos	106	" "	9 days
38	Scar and axilla	10 months	107	Ulcers ventriculi	11 "
39	Supraclav and scar	3 "	108	Pleuritis, suppurative	14 "
40	Supraclav	9 "	109	Cause unknown	28 "
41	Scar	9 "	110	" "	23 "
42	Scar, supraclav	4 "			
43	Scar	3 "			
44	Axilla, scar, right and left supraclav glands	1 month			
45	"Local recurrence "	Soon after discharge			
46	Scar, supraclav	Soon after discharge			
59	Scar	1 year			
60	Scar, supraclav	9 months			
62	Scar	6 "			
64	Scar	Immediately			
66	"Local recurrence "	1 month			
67	"Local recurrence " Su-	6 months			
68	praclav gl.				
69	Scar and supraclav glands	4 "			
70	Scar	10 "			
71	Scar	18 "			
72	Scar	3½ "			
74	Scar and axilla	6 months after operation			
75	Scar, axilla, and supraclav glands	2 months			
77	Scar	1 month.			
79	Scar	9 months			

¹ Eichel Ueber die in der Von Bergmann'schen Klinik von Herbst, 1882, bis Mai, 1887, operirten primären Fälle von Brustkrebs Inaug Diss Berlin, 1887

TABLE II—Continued

Local Recurrence, from 51 to 60 Per Cent			Died Soon After the Operation		
No	Situation	Time Post-Operat	No	Cause of Death	Time Post-Operat
80	"Local recurrence "	9 months			
82	Scar	5 "			
84	Skin near scar	2 "			
87	Scar	Soon after op			
88	Axilla	7 months			
91	Scar and supraclav glands	Soon after op			
92	Scar	17 mos after op			
93	Scar	5 months			
95	Scar	18 "			
96	Scar, axilla, and supraclav glands	Soon after op			
97	"Local recurrence," also supraclav glands	Few weeks after operation			
99	Scar, infraclav	5 weeks			
101	Scar	Soon after op			
102	Scar	3 months			
103	Scar	Few weeks after operation			
104	Scar	Very soon after operation			
94	"Local and regional recurrence "				
98	"Local and regional recurrence "				
45	"Recidiv "	4 months			
105	Scar and supraclav glands				

No Local Recurrence		Result as to Local Recurrence Unknown		Result Unknown
No	Time Post-Operat	No	Time Post-Operat	
1	4 years 9 months	61	† Less than 1 year	111
2	4 " 1 month	63	†	112
3	4 " 2 months	65	†	113
4	4 " 2 "	73	† 1 year 2 months	114
5	7 "	50	† 5 months	
6	3 " 10 months	54	† 6 "	
7	3 " 9 "	68	† 2½ years	
8	3 " 6 "	76	†	
9	3 " 9 "	78	†	
10	3 " 3 "	81	†	

TABLE II—*Concluded*

No Local Recurrence		Result as to Local Recurrence Unknown		Result Unknown
No	Time Post-Operat	No	Time Post-Operat	
11	3 years 1 month	86	†	
12	3 " 2 months	90	†	
13	2 " 10 "	83	†	
14	2 " 10 "	89	†	
15	2 " 7 "	100	†	
16	2 " 2 "			
17	2 "			
18	1 year 11 months			
19	1 " 3 "			
20	1 " 2 "			
21	1 " 1 month			
22	11 months			
23	1 year 5 months			
24	11 months			
25	6 "			
26	6 "			
27	6 "			
28	6 "			
29	7 "			
30	3 "			
31	3 "			
32	2 "			
33	2 "			
34	3 years 6 months			
47	†9 months			
49	†8 "			
53	†6 "			
58	†4 "			
48	†11 "			
55	†4 "			
52	†1 year 2 months			
57	†5 months			

TABLE III
Clinic of Billroth,¹ 1867-76 170 Cases
 Local Recurrence, 82 Per cent

No	Situation	Time Post Operat
34	Scar	Immediately
62	Skin near scar	Two days
63	Scar	Very soon
64	Miliary nodules near scar	One month
65	Axilla.	One month.
66	"Local recurrence "	?
67	"Local recurrence "	About one year
68	(1) Middle of scar	Six and a half months
	(2) Axilla	One year
69	Scar and granulating wound	Very soon
70	Skin near scar	Very soon
71	Scar	Two months
72	(1) Scar	Four months
	(2)	Ten months
73	Scar	
74	Supraclav glands	?
75	"Local recurrence "	?
76	Skin and axilla	?
77	Near scar	Two months
78	"Local recurrence "	Soon after discharge
79	Near scar	Soon after healing
80	Near scar	Soon after healing
81	Infraclav glands	Two months
82	Skin some distance from scar	Before complete healing
83	In scar	Soon after healing
84	"Local recurrence "	Soon after discharge
86	Near scar	Two years
87	Scar and axilla.	Three and a half years ?
88	Supraclav glands	Soon after healing
89	Near scar	Very soon
90	Skin, pectoral muscle, and axilla.	During healing
92	(1) Near scar	One year
	(2) Axilla	Three and a half years ?
93	Granulating wound	
94	"Local recurrence "	?
96	Near scar	One and a half years
97	Near scar	Soon after discharge
98	"Local recurrence "	Very soon
99	Axilla and edge scar	Few months
100	Infraclav glands	Very soon
101	Near scar and axilla	Soon after discharge

¹ A von Winniwarter Beiträge zur Statistik der Carcinome Stuttgart, 1876

TABLE III—Continued

No	Situation	Time Post-Operat
102	(1) Near scar and axilla	Soon after discharge
	(2)	Soon after second operation
103	Near scar	Soon after discharge
104	Axilla and near scar	Four weeks after discharge
106	Axilla and near scar, below scar	Soon after operation
107	Scar	Soon after healing
108	Scar	Soon after discharge
109	(1) Scar	Eighteen months
	(2) Axilla	Thirteen months
110	Scar	Soon after healing
111	Near wound before healing	
112	Scar	Eight months
113	Breast during healing	
114	Scar	Nine months
115	Axilla below scar	One and a half months
116	Skin and axilla	Soon after healing
117	Axilla near scar	Soon after healing
119	(1) Axilla	Sixteen months
	(2) Scar	Twenty-two months
122	(1) Near scar	About three years
	(2) In scar and skin	Six months later
124	Axilla	Immediately
	(2) Lower edge of pectoral muscle	Four and three-quarters years
125	(1) Skin, supraclav and infraclav gland, and axilla	About three years
	(2) Skin and axilla	Six years
130	Axilla and extirpated	Immediately
131	Axilla and infraclav glands	Immediately
132	Scar and axilla	Thirteen months
133	Scar and lower edge of pectoral muscle	One year
136	(1) Skin	Three months
	(2) Scar and axilla	Five years
137	Scar	Few months
138	Axilla	One year
141	(1) Scar, axilla, infraclav and supraclav glands	One year
	(2) Scar, infraclav and supraclav glands	One and a half years
	(3) Scar and near axilla	Two years
143	Scar	Three months
146	Breast and axilla	Three months
148	Scar and axilla	Seven months
153	Scar	One year
155	(1) Scar	Two years
	(2) Axilla	Four years

TABLE III—*Concluded*

No	Situation		Time Post-Operat		
159	(1) "Local recurrence "		Immediately		
	(2) Breast		Six years		
164	(1) Scar		One month		
	(2) Scar and axilla		Three months		
165	(1) Above scar		Four months		
	(2) Scar		Five months		

Died Soon After the Operation			No Local Recurrence		Result Unknown
No	Cause of Death	Time Post-Operat	No	Time Post Operat	No
28	Septicæmia	10 days	120	3 years	91
29	Pyæmia	37 "	154	5 " 9 months	118
30	"	22 "	156	3 " 3 "	121
31	"	12 "	157	6 " 1 month	123
32	"	11 "	158	3 " 8 months	126
33	Erysipelas	16 "	160	2 " 2 "	127
35	Septicæmia	3 "	162	2 " 1 month	128
36	Pyæmia	8 "	163	3 " 5 months	129
37	Septicæmia	Day of operation	167	2 "	134
		tion	168	1 year 1 month	135
38	Erysipelas	11 days	169	5½ months	139
39	Septicæmia	7 "	166	3½ "	142
40	Erysipelas	12 "	170	4 years 3 months	144
41	"	32 "	140	† 1 year 11 months	145
42	Pyæmia	16 "	161	† 1 year	147
43	"	11 "			148
44	Erysipelas	12 "			150
45	Septicæmia	14 "			151
46	Pleuritis	13 "			
47	Erysipelas	7 "			
48	Hæmorrhage axilla artery	7 "			
49	Erysipelas	41 "			
50	Septicæmia	2 "			
51	Erysipelas	7 "			
52	"	39 "			
53	Erysipelas and pneumonia	12 "			
54	Erysipelas	10 "			
55	"	37 "			
56	"	28 "			
57	Marasmus following erysip	63 "			
58	Erysipelas	16 "			
59	Hæmorrhage axilla artery	6 "			
60	Pleuritis	1 day			
61	Erysipelas	8 days			
62	acute internal disease	Soon after discharge.			

TABLE IV
Clinic of Czerny,¹ 1877-86 102 Cases

Local Recurrence, 60 Per Cent			Died Soon After the Operation		
No	Situation	Time Post-Operat	No	Cause of death	Time Post Operat
1	Scar	3 months	6	Erysipelas	18 days.
3	Scar	5½ years	26	Erysipelas	11 "
5	Scar	8 months	44	Erysipelas	13 "
7	Scar	3 months	45	Iodoform poisoning	23 "
8	Axilla	4 years			
9	Suture holes, skin, muscle, supraclav gl	4 months			
10	Scar, supraclav glands	1 month			
11	Lenticular recurrence of entire side	6 months			
17	Scar, supraclav and cervical glands	2 years			
18	Scar	3 months			
20	Scar and axilla	2 months			
21	Axilla	1 year			
	Scar	1½ years			
29	Scar and axilla	3½ years			
31	Scar and axilla	3 months			
33	Axilla and pect muscle	3 months			
	Scar	3 years			
34	Scar	4 months			
35	Scar	7 "			
36	Scar and axilla	3 "			
38	Lenticular recurrence about scar	8½ "			
43	Scar	3½ "			
	Axilla	1 year			
46	Axilla	2½ years			
48	Scar and axilla	1 year			
50	Axilla	11 months			
53	Scar	5 months			
	Axilla.	Later			
61	Scar	1 month			
64	Scar	5 months			
68	Scar	7 "			
72	Scar	2 "			
74	Scar	1 month			
83	Scar	6 weeks			
86	Scar and axilla.	1½ years			
88	Scar and axilla.	4½ months			
91	Lenticular in skin	2 "			
92	Above scar	3 "			
96	Lenticular recurrence about scar	8 (?) "			
99	Scar	6 "			
102	Scar	2 "			
	Axilla.	7 "			

¹ G B Schmidt. Die Geschwülste der Brustdrüse, Beiträge zur klinischen Chirurgie, Bd IV, 1889

TABLE IV—*Concluded*

No Local Recurrence		No Note as to Local Recurrence			Result Unknown
No	Time Post-Operat	No	Cause of Death	Time Post-Operat	No
5	9½ years	13	Enlarged axillary glands not removed at operation		4
12	†1¾ years				12
16	†1 year				14
22	7 years				19
23	†3 "	25		†1 year	27
24	†7 "	47		†1 year 9 months	28
32	7 years 2 months	51	Carc ventriculi	†11 months	30
40	†5½ months	52		†4 months	37
49	5 years 7 months	54		†1 year	39
70	4 " 3 "	55	Carc other breast	†1 year	41
77	3 " 10 "	57		†6 or 8 months	56
79	1 year 10 "	59		†3 months	58
80	4 years 5 "	60		†2 years	62
81	†4 months	66		†3 months	63
84	4 (?) years	73		†6 "	65
89	1 year 8 months	75		†10 "	67
90	1 " 8 "	76		†7 "	69
93	1 " 7 "	78		†1½ years	72
97	1 " 1 month	94		†7 months	81
100	2 (?) years	98	Pleuritis	†Less than 1 year	82
109	2 (?) years				87
					98

TABLE V
Clinic of H Fischer,¹ 1871-78 147 Cases

Local Recurrence, 75 Per Cent			Died from the Operation, or too soon to Exclude Local Recurrence			No Local Recurrence		Result Un Known
No	Situation	Time after Operation	No	Cause of Death	Time after Operation	No		No
15	Scar	9 months	109	Exhaustion	Few weeks	1	8½ years	111
19	Scar and axilla	15 months	118	General carcinoma	4 weeks	2	7½ years	114
26	Scar					3	7 years	115
29	"Recurrence" probable	18 "	119	Pyæmia	1 week	4	6 years	116
30	Scar and axilla		120	Croupous pneumonia	1 month	5	6 years	117
31	Scar	28 "	121	Anæmia	1 "	6	5 years	
32	Scar	8 "	122	Septicæmia	8 days	7	4½ years	
33	Scar and supra-clav glands	12 "	123	Pyæmia	1 month	8	4½ "	
34	Scar	18 "	124	Acute peritonitis	15 days	9	3½ "	
35	Scar and axilla	7 "	125	Pyæmia	8 "	10	3½ "	
36	Scar	11 "	126	Erysipelas	18 "	11	3½ "	
37	Scar and skin	18 "	127		A few weeks	12	3½ "	
38	Scar and axilla	3 "	128	Edema of the lungs	4 days	13	2½ "	
39	Scar	12 "				14	2½ "	
40	Scar, neck, and skin		129	Septicæmia	2 "	15	1½ "	
41	(1) Skin and axilla	18 "	130	Pleuritis	34 "	16	1½ "	
	(2) Scar	6 "	131	Inanition	2 months	17	1 "	
42	Scar		132	Septicæmia	8 days	18	1 "	
43	Scar		133	Pyæmia	A few days	19	9 months	
44	Scar and skin	9 "	134	Pyæmia	22 days	20	1 year	
45	"Recurrence"	3 "	135	Septicæmia	10 "	21	1 "	
46	Axilla, skin, and under pectoral muscle	5 "	136	Erysipelas	12 "	22	9 months	
47	Scar and sternum	30 "	137	Erysipelas	4 "	23	1 year	
48	"Recurrence"		138	Pyæmia	18 "	24	9 months	
49	Scar	18 "	139	Septicæmia	6 "	25	4 years	
50	Recurrence "	3 "	140	Gangrene	6 "	26	6 months	
51	Scar	6 "	141	Erysipelas	4 weeks	27	6 months	
52	Scar	9 "	142	Erysipelas	40 days	28	2 years	
53	Scar	6 "	143	Diphtheria	2 weeks	107		
54	Scar	6 "	144	Septicæmia	4 weeks	113		
55	Scar	3 "	145	Apoplexy	9 days			
56	"Recurrence"		146	Fatty heart	48 days			
57	Recurrence "		147	Meningitis	3 weeks			
58	Recurrence "							
59	Axilla	Less than one year						
60	"Recurrence"	3 months						
61	"Recurrence"	6 "						
62	Axilla							
63	Scar	9 "						
64	"Recurrence"	6 "						
65	"Recurrence"	6 "						

¹ Arthur Henry Statistische Mittheilungen über der Brustkrebs, 1871-78, Inaug Dissert Breslau, 1879

TABLE V—*Concluded*

Local Recurrence, 75 Per Cent			Died from the Operation, or too soon to Exclude Local Recurrence			No Local Recurrence		Result Un- known
No	Situation	Time after Operation	No	Cause of Death	Time after Operation	No		No
66	"Recurrence "							
67	"Recurrence "	12 months						
68	Axilla	28 "						
69	"Recurrence "							
70	Scar	3 "						
71	Scar	Few weeks						
72	"Recurrence "							
73	"Recurrence "	6 months						
74	Skin	9 "						
75	Scar	3 "						
76	"Recurrence "	6 "						
77	Supraclav glands	6 weeks						
78	Scar	3 months						
79	Scar	6 months						
80	Scar	Few weeks						
81	Skin	6 months						
82	"Recurrence "	3 "						
83	Scar							
84	Axilla and supra- clav glands	9 "						
85	Scar	2 "						
86	Scar	12 "						
87	Scar	9 "						
88	"Recurrence "	6 "						
89	"Recurrence "	6 months						
90	"Recurrence "	6 "						
91	Scar	Few weeks						
92	Scar and axilla	12 months						
93	Scar and axilla	6 "						
94	Scar	3 "						
95	Axilla	15 "						
96	"Recurrence "	12 "						
97	Scar and axilla	3 "						
98	"Recurrence "	3 "						
99	Scar and axilla	Few weeks						
100	Scar	3 months						
101	Scar	3 "						
102	Scar	2 "						
103	Skin	6 "						
104	Scar and axilla	6 "						
105	"Recurrence "							
106	Scar	Few weeks						
108	Scar and axilla	3 months or less						
110	Scar	9 months or less						
112	Scar and axilla	8 months or less						

TABLE VI
Clinic of Gussenbauer,¹ 151 Cases

Local Recurrence, 64 Per Cent			Died soon after the Operation			No Note as to Local Recurrence			No Local Recurrence		Result Un- known
No	Situation	Time Post Operat	No	Cause of Death	Time Post Operat	No		Time Post Operat	No	Time Post Operat	
38	Scar two places	10 months	33	Sepsis and pneu- monia	1 month	54	†Carc lungs and vertebræ	1 year	68	†2 years	176
39	Scar	2 "							92	†1 year	179
40	Recurrence	12 "	34	Pneumonia	21 days	59	†Carc sternum	1 year	94	†1½ years	180
41	Scar	7 "	35	Died on opera- ting table		75	†Carc ventriculi	18 months	96	†6 months	181
42	Recurrence	(?)	36	Erysipelas	3 weeks	77	†Carc ventriculi	2 years	98	†4 "	183
43	Scar	32 months	37	Erysipelas	Few days	99	†Carc ventriculi	6 months	114	†14 "	184
44	Scar and axilla	Immediately	111	Metastases	1 month	107	†	11 months	121	†9 "	185
45	Scar, axilla, and neck	12 months				102	†	5 "	126	†1 year	
46	Scar	32 "				113	†Cachexia	3 "	135	9½ years	
47	Axilla	3 "				120	†Carc ventriculi	4 "	136	9 yrs 9 mos	
48	Scar and axilla	Immediately				123	†Carc pleura	5 "	137	7 " 2 "	
49	Axilla and skin	(?)				128	†Carc liver and possibly stomach		138	6 " 9 "	
50	Recurrence	(?)							139	6 " 7½ "	
51	Scar and axilla	4 months							140	5 " 9½ "	
52	Scar and axilla	6 weeks							141	5 " 7 "	
53	Scar	3½ months							142	5 " 6 "	
55	Supraclav glands and skin	Few months							143	5 " 5½ "	
56	Scar	(?)							144	5 " 15 days	
57	Axilla and supraclav	8 months							145	3 " 10 mos	
58	Scar and axilla	6 "							146	3 " 10 "	
60	Recurrence								147	3 " 8 "	
61	Scar and axilla	9 "							148	3 " 10 "	
62	Recurrence	6 "							150	3 " 10 "	
63	Scar	16 "							151	3 " 30(?) "	
64	Scar	Immediately							152	3 " 2 "	
65	Skin	10 months							153	3 " 4 "	

¹ Dr Franz Fink ein Beitrag zu den Erfahrungen über die operative Behandlung des Mammacarcinoms, 1878-86 Prager Zeitschrift für Heilkunde 1888

TABLE VI—Continued

Local Recurrence 64 Per Cent			Died soon after the Operation			No Note as to Local Recurrence			No Local Recurrence		Result Un-known
No	Situation	Time Post-Operat	No	Cause of Death	Time Post-Operat	No	Time Post-Operat	No	Time Post-Operat		
66	Scar	(?)						154	3 yrs 3 mos		
67	Recurrence	(?)						155	2 " 5 "		
69	Scar	4 weeks						156	2 " 1 month		
70	Scar	(?)						157	2 " 1 "		
71	Inoperab canc en cuirasse	3 years						158	1 year 8 months		
72	Scar	2 years						159	1 year 7 months		
73	Scar	1½ years						160	1 " 6 "		
74	Scar	5 months						161	1 " 6 "		
76	Scar	Few weeks						162	1 year		
78	"Recurrence "	?						166	† 4 yrs 7 mos		
79	Scar and axilla	4 years						167	† 7 " 4½ mos		
80	Scar and axilla	Immediately						168	† 3 " 11 "		
81	Scar	Very soon						169	† 3 " 4½ "		
82	Scar	4 months						170	† 1 yr 6 mos		
83	Scar	10 months						171	† 2 yrs 4 mos		
84	Scar	Immediately						172	† 1 yr 1½ mos		
85	Scar	11 months						173	† 1 yr 1½ mos		
86	Scar	3 years						174	† 2½ years		
87	Middle of scar	22 months						175	† 3 "		
88	Scar	3 months						178	† 9 "		
89	Scar	4 weeks									
90	Scar	6 months									
91	Scar, axilla, and supra-clav	8 months									
93	Scar	Immediately									
95	Scar	Very soon									
97	"Recurrence "										
100	Scar and axilla	Very soon									
101	Scar	Very soon									
102	Scar and axilla	3½ months									

TABLE VI—*Concluded*

Local Recurrence, 64 Per Cent		Died soon after the Operation		No Note as to Local Recurrence		No Local Recurrence		Result Un- known
No	Situation	Time Post Operat	Cause of Death	Time Post Operat	No	Time Post Operat	No	
103	Scar	3 months						
104	Scar	12 "						
105	Scar	3 "						
106	"Recurrence "	11 "						
107	Scar	Very soon						
108	Scar	Immediately						
109	Scar	Very soon						
110	Scar	Very soon						
111	Scar and axilla	15 months						
112	Scar	3 weeks						
113	Scar	Very soon						
114	Scar	" "						
115	Scar and axilla	" "						
116	Scar	" "						
117	Scar	4 weeks						
118	Scar	6 weeks						
119	Scar and axilla	12 months						
120	Scar	Very soon						
121	Scar and axilla	" "						
122	Axilla	" "						
123	Scar and axilla	(?)						
124	Scar and axilla	(?)						
125	Scar	14 months						
126	Scar and axilla	4½ "						
127	Scar	8 "						
128	Scar and axilla	9 "						
129	Scar	Immediately						
130	Scar and axilla							
131	Scar							
132	Scar and axilla							
133	Scar and axilla							
134	Scar, axilla, & supra-clav gl							
135	Scar							
136	Scar							
137	Scar							
138	Supraclav							
139	Scar and axilla							
140	Scar							

TABLE VII
Clinic of König,¹ 1875-85 152 Cases

Local Recurrence 58-62 Per Cent			Died soon after the Operation			No Local Recurrence		No	Result Unknown
No	Situation	Time Post Operat	No	Cause of Death	Time Post-Operat	No	Time Post-Operat		
1	Skin	4 weeks	5	Erysipelas	10 days	3	11 years	21	Carc vertebrae, died less than one year
2	Skin and axilla	3 months	10	"Abdominal disease"	51 "	4	14 "		General carcinosis
7	Axilla	1½ years	13	Apoplexy	50 "	6	14 "	28	Result unknown
11	Axilla and skin	After 3 years	15	Erysipelas	12 "	8	13 months	35	(?)
18	Axilla	3 years	16	Septicæmia	8 "	9	13 "	58	
22	Scar	2 "	19	(?)	Few days	12	4 years	64	†1 year
24	Scar, "curasse"	2 months	20	Hemorrhagic lung infarction	2 days	14	6 "	95	†18 months (?)
25	Scar	1 year	29	Septicæmia	9 "	17	9 "	121	(?)
27	"Curasse"	3 months	33	Pneumonia	16 "	23	3 "	122	(?)
30	Scar	3 or 4 months (?)	61	Erysipelas and pneumonia	8 "	26	6 "	130	†1 year
36	Scar	6 months or less	69	Drowned	2 months	31	6 "	131	†6 months Carc liver
37	Scar	8 months	74	Broncho-pneumonia	11 days	40	7 "	134	(?)
38	Axilla	16 "	76	Pneumonia	9 "	41	6 "	138	(?)
39	Axilla	1 month	98	Erysipelas	6 "	44	6 "	139	†1 year Carc liver
42	(?) Recurrence	8 months	91	Pneumonia, cancer of lungs and bronchi	19 "	45	3 "		
43	Scar and above clav	3 years				46	6 "		
47	Axilla	1 year				49	6 "		
48	"Recurrence"	6 months				54	6 "		
50	Axilla and scar	11 "				62	†17 months		
51	Scar	Never healed				80	4 years		
52	"Local recurrence"	2 or 3 months				83	4 "		
53	Axilla	5 months				84	3 "		
55	Scar and axilla	Immediately				86	4 "		
56	Scar	2 months				87	4 "		
57	Above scar	Immediately				90	3 "		
58	Axilla and above clavicle	† 2 years or less				97	1 year		
60	Scar (?)	Immediately				105	2½ years		
63	"Recurrence"	†1 year							

¹ Hildebrand Beitrag zur Statistik des Mammacarcinoms der Frau, Deutsche Zeitschrift für Chirurgie, Bd xxv, 1887

TABLE VII—Continued

Local Recurrence, 58-62 Per Cent			Died soon after the Operation			No Local Recurrence		No	Result Unknown
No	Situation	Time Post Operat	No	Cause of Death	Time Post Operat	No	Time Post Operat		
65	Scar	†1 year				108	†1½ years Cancer of kidney		
66	Scar	4 months				110	2 years		
67	"Recurrence "	6 "				113	3 "		
68	"Recurrence," sternum	(?) years				114	2 years		
70	pect muscle	†3½ months				116	†Less than 1 year		
71	Scar never healed	13 months					Suicide		
72	Scar and axilla	†8 "				117	2 years		
73	Scar and skin (?)	Immediately				118	2 "		
75	Scar	1 year				119	2 "		
77	Skin and axilla	†6 months				123	6 months		
78	"Recurrence "	6 "				124	†1 year		
81	Scar and axilla	14 "				128	1½ years		
82	Scar (?) and axilla	6 "				129	1 year		
85	"Recurrence "	6 "				135	†2 years		
89	Scar and axilla	10 "				137	3 years		
92	Axilla	6 "				145	3 "		
93	Scar	6 "				146	3 "		
94	Skin	6 "				150	2 "		
96	Scar	6 "				151	6 months		
98	Scar	10 "				152	6 "		
99	Scar and skin	2 years				34	†1 year		
100	Scar and axilla	2 years 7 months				32	†6 months		
101	Scar	†11 months				28	†6 "		
103	Scar	†13 "				79	†6 "		
104	"Recurrence "	2 "				102	†6 "		
106	Scar	Less than 3 months				111	†5 "		
107	Scar	Less than 1 year							
	Scar	†6 months							
	Second and third operations	6 "							
		†1 year							

TABLE VII—*Concluded*

Local Recurrence, 58-62 Per Cent			Died soon after the Operation			No Local Recurrence		No	Result Unknown
No	Situation	Time Post Operat	No	Cause of Death	Time Post-Operat	No	Time Post Operat		
109	Axilla	2 months							
112	Axilla	6 "							
115	Scar	5 "							
120	Skin below and near scar	9 "							
125	Recurrence scar and above clavicle								
126	Scar	6 months							
127	Scar	Few weeks							
132	Pect major near axilla	5 months							
133	Scar (?)	1 year							
	Operated four times, still alive	4 years							
136	Scar and axilla	9 months							
140	Scar (?) and axilla	12 years with recurrence							
141	Scar	1 year (?)							
142	Scar	6 months							
143	Scar								
144	Scar	Immediately (?)							
147	Scar	1 year							
	Second operation, alive three years after								
148	Scar (?) and skin	3 months							
149	Scar	1 year							

TABLE VIII
Clinic of Kistler¹ From May, 1871, to December, 1885 228 Cases

Local Recurrence, 59 Per Cent			Died soon after the Operation			No Local Recurrence			No Note as to Local Recurrence			No	Result Unknown
No	Situation	Time Post Operat	No	Cause of Death	Time Post Operat	No	Time Post Operat	No	No	Cause of Death	Time Post Operat		
1	(1) Scar	8 months	2	Erysipelas	13 days	18	15 years	37	†	Care of pleura and stomach	2 yrs 5 mos	57	
2	(2) Axilla scar	14 "	10	Erysipelas	18 "	34	"	39	†	Care of pleura	3 months	65	
3	Axilla	Soon after healing	11	Erysipelas	9 "	40	3 "	41	†	Erysipelas	5 "	70	
4	Scar	Immediately	25	Pyæmia	12 "	42	3 "	67	†	"Recurrence" (pleura?)	2½ years	78	
5	(1) Scar	"	28	Erysipelas	19 "	43	4 "	69	†	"Recurrence" (carc vertebral column)	2½ "	83	
6	(2) Skin of neck	8 months	31	Profuse diarrhoea	5 "	50	4 "	72	†	"Recurrence" (vertebral column & liver)	(?) 13 mos	92	
7	(3) Breast and axilla	11 "	35	Erysipelas	10 "	51	7 "	84	†	"Recurrence" lung cancer	3½ years	106	
8	(4) Near scar, axilla	13 "	47	Collapse	2 "	55	½ "	96	†	"Recurrence" "	1 year	107	
9	"Recurrence"	Very soon	53	Pleuritis carci- nomatosa	3 "	56	7 "	95	†	Care of pleura	½ years	177	
10	"Local Recurrence"	Immediately	59	Septicæmia	6 "	58	6 "	102	†	Probably metas- tases	1 year	179	
11	"Local Recurrence"	Very soon	91	Collapse	3 "	77	6 "	116	†	Cause unknown	1½ years	180	
12	"Local Recurrence"	Very soon	100	Erysipelas	16 "	80	4 months	144	†	Care of pleura	10 months		
13	"Local Recurrence," pectoralis major, etc	(?)	104	Erysipelas	16 "	98	5 years	146	†	Care of abdomen	9 months		
14	Under scar	8 months	108	Attack of dysp- noea	2 "	101	4 "	150	†	General care	1 year		
15	"Local Recurrence"	2 years	122	Pleuritis	44 "	17	10 "	151	†	Care of lungs	1 yr 2 mos		
16	"Local Recurrence"	4 months	125	Erysipelas	10 "	109	3 "	154	†	Metastases			
17	"Local Recurrence"	Immediately	128	Edema of lungs	11 "	112	3 "						
18	"Local Recurrence"	3 months	139	Sepsis	6 "	118	3 "						
19	(1) Scar	6 "	140	Sepsis	Immediately	126	3 "						
20	(2) Axilla	7 "	141	Sepsis	10 days	182	2½ "						
21	Axilla	Very soon	142	Sepsis	7 days	183	3 "						
22	"Local Recurrence"	3 times	143	Pneumonia and nephritis		184	2 "						
23	Axilla and near scar	4 months				185	2 "						
24						186	2 "						
						187	2 "						
						188	2½ "						

¹ (1) Zur Statistik der Mammarcarcinome und deren Heilung V Schmidt Deutsche Zeitschrift für Chirurgie Bd xxvi 1887 (2) Fünf Jahre im Augustabspital Berlin 1887 (3) Ein chirurgisches Triennium Berlin 1882 (4) Zur Behandlung des Brustkrebses Verhandlung der Deutschen Gesellschaft für Chirurgie 1883

TABLE VIII—Continued

Local Recurrence, 59 Per Cent			Died soon after the Operation			No Local Recurrence			No Note as to Local Recurrence			No	Result Unknown
No	Situation	Time Post-Operat	No	Cause of Death	Time Post Operat	No	Time Post-Operat	No	Cause of Death	Time Post-Operat	No		
26	"Local Recurrence "	1 year	127	Carc liver	Very soon	189	2 1/2 years	156	†Carc of pleura	3 months	106	†Carc of pelvis	
27	Infraclav glands	4 1/2 years	93		6 weeks after discharge	190	2 "	157	†Unknown Cause	1 year			
29	"Local Recurrence," 5 times	Very soon				191	9 months	161					
30	"Local Recurrence "	5 months				192	1 yr 10 mos						
32	"Local Recurrence "	10 "				193	" "						
33	"Local Recurrence "	Soon				194	" "						
36	"Recurrence "	3 yrs 10 mos				195	2 yrs 3 mos						
45	(1) Scar	1 year				196	1 1/2 years						
	(2) Scar	2 years				197	1 yr 7 mos						
	(3) Supraclav glands and scar	4 "				198	1 yr 8 mos						
48	"Recurrence "	†14 months				199	9 months						
49	Skin and axilla	2 months				200	1 yr 7 mos						
52	Axilla	1 1/2 years				201	1 yr 7 mos						
54	"Recurrence "	1 yr 10 mos				202	2 yrs 1 mo						
60	"Recurrence "	†14 months				203	1 yr 4 mos						
61	"Recurrence "	†3 "				204	1 yr 4 mos						
63	"Local recurrence "	†1 yr †2 yrs				206	1 year						
64	(1) Scar	8 months				207	1 year						
	(2) Scar	11 "				208	11 months						
66	"Local recurrence "	†6 1/2 months				209	5 years						
68	Scar, axilla, and supraclav glands	Immediately				210	1 yr 4 mos						
71	"Local recurrence "	†3 years				211	10 months						
73	Scar	1 year				212	13 "						
74	"Local recurrence "	2 years				213	7 "						
75	Cancer <i>en cuirasse</i>	†1 yr 4 mos				214	5 "						
76	"Local recurrence "	3 months				216	5 "						
79	Near scar	1 year				217	5 "						
81	Near scar	Very soon				218	4 "						
						219	8 "						
						220	8 "						

TABLE VIII—Continued

[illegible]

TABLE IX
Clinic of Lücke,¹ 1881-90 110 Cases
 Local Recurrence, 66 Per Cent

No	Situation	Time Post-Operat
5	"Local recurrence "	2 months Patient lives
11	Pect major	6 months Patient lives
13	Scar	1 year
	(2) Recurrence	2 months Patient lives
24	"Local recurrence "	Died 3 months after operation
26	Scar, vertebræ, leg	2 months
27	"Local recurrence "	months (?)
28	"Local recurrence "	Very soon after operation
31	Scar	6 months
	(2) "Local recurrence "	
32	Scar	Few months
34	Scar	17 months
35	"Local recurrence "	Died 4 years after operation
36	"Recurrence "	1½ years
39	"Local recurrence "	Very soon
	(2) "Local recurrence "	Very soon
40	Scar	1 month
42	Skin	6 days before dismissed
44	"Local recurrence "	7 months
47	Axilla.	Few months
49	"Local recurrence "	Immediately
50	Skin	Very soon
51	"Local recurrence "	Died 13 months
53	Axilla.	2 months
	Second recurrence	†1 year
54	Scar	1 year
55	"Local recurrence "	1 year
56	"Local recurrence "	†3½ years
58	"Local recurrence "	†7 months
59	Ulceration in scar	†2 years after operation
61	Scar	1 month
62	Scar	24 days
63	"Local recurrence "	6 months and 9 months
64	"Local recurrence "	months (?)
65	"Local recurrence "	Very soon
66	"Local recurrence "	Very soon
67	(1) "Local recurrence "	4 months
	(2) "Local recurrence "	Very soon
68	"Local recurrence "	1 year

¹ Dietrich Beitrag zur Statistik des Mammacarcinoms, Deutsche Zeitschrift für Chirurgie, Bd xxxiv, 1892

TABLE IX—*Concluded*

No	Situation	Time Post-Operat
70	"Local recurrence "	†3½ years
71	"Local recurrence "	†9 months
73	"Local recurrence," axilla, sup and infraclav	39 days
74	"Local recurrence "	†7 months
75	"Local recurrence "	6 months
	(3) Local recurrences	†
76	"Local recurrence "	†11 months
77	"Local recurrence "	†13 months
78	"Local recurrence "	3 months or less
	(3) Local recurrences	
79	"Local recurrence "	†9 months
80	"Local recurrence "	†7 months
81	"Local recurrence "	†13 months
82	Scar	4 months
84	Axilla	6 weeks
87	Axilla	22 days
88	"Local recurrence "	†10 months

Died Soon After the Operation			No Note as to Local Recurrence			No Local Recurrence	
No	Cause of Death	Time Post Operat	No	Cause of Death	Time Post-Operat	No	Time Post Operat
25	Pneumonia	16 days after operation	41		†7 months after operation	1	10½ years
29	Erysipelas	14 days after operation	69	Phthisis	1½ years	2	7½ "
30	Erysipelas	16 days after operation	72	Metastases	†15 months	3	7 "
33	Erysipelas	16 days after operation	83	(?)	†1½ years	4	6½ "
			85	Old age	†(?)	6	4½ "
37	Brain metastases	39 days after operation	89	Liver metastases	†Less than 6 months	7	4½ "
46	Erysipelas	14 days				8	4½ "
48	Lung embolism	15 days				9	4½ "
60	(?)	Soon after operation				10	3½ "
86	Edema of lungs, cancer of lungs, liver, spleen, omentum	10 days				12	2 yrs 10 mos
						14	3½ years
						15	1½ "
						16	1½ "
						17	13 months
						18	1½ years
						19	1 year
						20	1 "
						21	1 "
						22	1 "
						23	10 months
						38	†4½ years
						43	†1 year
						45	†2 yrs 4 mos
						52	†4 years
						57	†4 "

TABLE X

Clinic of Volkmann¹ 1874-78 131 Cases

Local Recurrence, 59 Per Cent

No	Situation	Time Post-Operat
1	Pectoralis major	Two years
2	Scar	Less than two years
3	Scar	Less than two years
4	Scar	Less than six months
7	Scar	Three months
9	Scar and axilla	Less than six months
10	Scar	Eleven months
12	Near scar	Two months
13	Scar and axilla	One year
15	"Local recurrence "	Before healing
16	Above scar	Two months
17	Near scar	Ten "
18	Close to scar	Eight "
19	"Local recurrence."	Five "
21	Above scar	Less than two years
23	"Local recurrence "	Very soon
25	"Recurrence," under pectoralis major	One month
27	Scar	Very soon
29	"Recurrence" near scar	Four months
32	Scar	Very soon
34	Scar	Five months
36	Axilla.	Five "
42	Scar	Five "
43	"Local recurrence "	Very soon
47	Pectoralis major	One year
48	"Local recurrence "	Eight months
49	"Local recurrence "	One year ten months
51	"Local recurrence "	One and a half years
52	"Local recurrence "	Several times
57	Scar	Ten weeks
59	"Local recurrence "	†One and a half years
61	"Local recurrence "	One year
65	Near scar	Few weeks
67	"Local recurrence "	Two years
73	"Local recurrence "	Very soon after discharge
74	Scar	One month
79	Ribs and sternum	
80	Near scar (?)	One month
83	Axilla (?)	(?)

¹ Sprengel Archiv für klinische Chirurgie, Bd xxvii, 1882

TABLE X—Continued

No	Situation	Time Post-Operat
86	(?)	About one year
87	"Recurrence "	†One year
89	Scar and axilla	†Less than four months
92	Skin and axilla	Less than one year
93	Sternum	One month
94	Near scar and in axilla	Four months
95	"Recurrence" about scar	Ten months
98	Near scar	Twenty days
100	Scar	Two and a half years
102	"Local recurrence," skin	One and a half years
104	"Local recurrence" above scar	†Six months
107	"Local recurrence "	Half year
108	Scar and axilla	Three months
111	"Local recurrence," scar	†Six months
113	During healing above wound	
116	"Recurrence," axilla	†One and a half years
121	"Recurrence," axilla and skin	Two months
123	Scar	Eleven months
124	"Local recurrence "	†One year ten months
125	"Local recurrence "	One year seven months
129	Scar	Two months
130	Scar	One year
131	Scar	Six months

Died soon after Operation			No Note as to Local Recurrence			No Local Recurrence		Result Un-known
No	Cause of Death	Time Post-Operat	No	Cause of Death	Time Post-Operat	No	Time Post-Operat	No
6	Erysipelas & pneumonia	1 day	5	†Metastases	4 months	8	7 years	66
20	Exhaustion	19 days	28	†Cancer of lungs	2 years	11	6 "	68
24	Collapse	15 "	31	†Metastases	1 year	22	6 "	77
26	Gangrene of skin	20 "	41	† (?)	2 yrs 4 mos	33	6 "	97
30	Septicæmia	6 "	45	†Pericarditis	6 months	35	6 "	120
39	(?)	2 mos	50	†Metastases	2 years	37	6 "	
60	Bronchitis	1½ mos	70	†Exhaustion	1 year	38	6 "	
69	Septicæmia	16 days	81	†Cancer	1 "	40	†9 months	
119	Secondary lung embolism	2 mos	82	†Cancer	6 months	44	6 years	
122	Exhaustion	16 days	103	†Cancer of femur	6 "	46	†6 months	
						53	†4 years	
						54	1 yr 3 mos	
						55	†1 yr 7 mos	
						56	5 years	
						58	†1½ yrs	

TABLE XI

[illegible]

Regional recurrence

MEDICAL CLASSICS

VOL. 3

January, 1939

NO. 5



CONTENTS

Portrait of Claude Bernard - - - - - 512

Claude Bernard

Biography - - - - - 513

Introduction to Work - - - - - 516

Bibliography of Writings - - - - - 518

Index to Bibliography - - - - - 540

Bibliography of Bibliographies - - - - - 545

De l'Origine du Sucre dans l'Économie Animale
Le Dr Cl Bernard - - - - - 552

The Origin of Sugar in the Animal Body Claude
Bernard - - - - - 567

Du Suc Pancréatique et de son Rôle dans les Phéno-
mènes de la Digestion Le Dr Cl Bernard - 581

Pancreatic Juice and Its Rôle in the Phenomena of
Digestion Claude Bernard - - - - - 600



CLAUDE BERNARD

MEDICAL CLASSICS

VOL. 3

January, 1939

NO. 5



Claude Bernard

BIOGRAPHY

- 1813 July 12, born at Saint-Julien, canton de Villefranche (Rhône), France, the son of a winegrower and schoolmaster.
- 1821 Age 8 Began schooling with instruction in Latin at house of Curé Bourgaud Later entered the Jesuit College of Villefranche
- 1830 Age 17 Attended the college of Thoissey (Ain) for one year
- 1832 Age 19. Because his family could no longer afford to keep him in school, Bernard went to work for a pharmacist, M Millet, in the Faubourg de Vaise of Lyons In his time from work, he attended the local theatre, wrote a vaudeville, "La Rose du Rhône," and a five act drama
- 1833 Age 20 Discharged from the pharmacy shop because he was a dreamer.
- 1834 Age 21. Took his drama to Paris to M Saint-Marc Girardin, professor of literature at the Sorbonne, who advised him to study medicine Entered the Medical School of Paris where he studied anatomy diligently and showed skill in dissecting
- 1836 Age 23 Became *externe* and taught natural history in a girls' school.
- 1839 Age 26 In competitive examination for *interne*, Bernard passed but ranked twenty-sixth out of twenty-nine
- 1840 Age 27 Studied under Falret, Velpeau, Maison-neuve and Magendie
- 1841 Age 28 Became Magendie's *preparateur* at the Collège de France.

- 1843 Age 30 Obtained his medical degree, writing a thesis on the gastric juice and its rôle in nutrition. He never practiced medicine but at once became a laboratory and research worker.
- 1844 Age 31 Sought position as assistant professor of anatomy and physiology on the Faculty of Medicine but failed in the competition.
- 1845 Age 32 Married Marie Françoise Martin whose father was Henri Martin, a physician in Paris, 2 daughters survived Bernard but 2 sons died in infancy. Sought to augment his income by preparing anatomical dissections, helping M. Ch. Huette prepare a book on surgery and seeking, with Dr. Lasèque, to establish a private laboratory.
- 1847 Age 34 Appointed substitute lecturer to Magendie at the Collège de France. Elected to his first scientific society, The Société philomathique de Paris.
- 1848 Age 35 Aided in founding the Société de Biologie, was one of its two vice-presidents and took a very active part in the meetings.
- 1849 Age 36 Awarded the red ribbon of the Legion of Honor in recognition of his work in the rôle of the pancreas in digestion, which had also won for him for the second time the prize in experimental physiology of the Academy of Sciences. Also announced his discovery of diabetes following a wound in the floor of the fourth ventricle.
- 1851 Age 38 Awarded, for the third time, the prize in experimental physiology, this time for his work on the glyco-genic function of the liver.
- 1852 Age 39 Discovered the vasomotor system of nerves.
- 1853 Age 40 Given degree of Doctor of Natural Sciences. Awarded, for the fourth time, the prize in experimental physiology, now for work on the sympathetic nerves. Shortly afterward he became the chairman of the committee awarding the prize and thus never received it again.
- 1854 Age 41 Elected to membership in the Academy of Sci-

ences. A chair of physiology on the Faculty of Sciences at the Sorbonne was created for Bernard

- 1855 Age 42 On death of Magendie, Bernard succeeded him as Professor of Medicine at the Collège de France
- 1857 Age 44 Isolated glycogen
- 1860 Age 47. Received the Order of the Polar Star from Sweden and Norway
- 1861 Age 48 Elected to the Académie de Médecine Illness prevented work
- 1862 Age 49 Appointed by the Emperor to a consulting committee on Hygiene and Medical Service in the hospitals Promoted to the rank of Officer of the Legion of Honor
- 1864 Age 51 Became foreign member of the Royal Society of London, Academy of Sciences of Berlin and of St. Petersburg
- 1866 Age 53 Forced to cancel his winter course at the Collège de France because of poor health which had incapacitated him frequently after 1861 Retired to his country home at Saint-Julien.
- 1867 Age 54 Returned to Paris but his health allowed him only to continue his writings and not to return to his lecture room or laboratory Elected perpetual president of the Société de Biologie Became Commander in the Legion of Honor
- 1868 Age 55 Transferred his course in General Physiology from the Sorbonne to the Museum of Natural History. Elected a member of the French Academy
- 1869 Age 56 His health being improved, he again began to lecture Elected president of the Academy of Sciences Became a senator by Imperial decree
- 1872 Age 59 Elected first president of the French Association for the Advancement of Science
- 1876 Age 63 Awarded the Copley Medal of the Royal Society
- 1878 Age 65. Died February 16 of pyelonephritis Buried in the cemetery of Père Lachaise after a funeral at public expense, the first scientist to be thus honored

INTRODUCTION TO THE WORK OF
CLAUDE BERNARD

Claude Bernard went directly from medical school to the laboratory and never treated a patient. Nevertheless, he was one of the greatest contributors to medical science.

While a medical student, Bernard became Préparateur to the great Magendie at the Collège de France. This famous man recognized his pupil's capabilities and declared shortly after the onset of their association that Bernard was the better man.

Before his graduation in 1843, Bernard was already interested in the laboratory approach to medical problems. In that year he discovered that cane sugar appears in the urine after being injected into veins but only on condition that the cane sugar has not been treated with gastric juice prior to its injection. This was the starting point of Bernard's research on the relation of sugar and glycogen to liver physiology and is described in his graduation thesis.

The first paper herein reproduced in its entirety "De l'origine du sucre dans l'économie animale" was published in 1848. Bernard made the chance observation that sugar is present in the vein leading from the liver to the heart, even though his experimental animal, the dog, had been fed on a meat diet. Other workers had observed that sugar is present in the hepatic vein but they believed that the sugar is always that taken in with food. Bernard showed that even when no sugary food is present in the intestinal tract, sugar still is given off by the liver. By a series of carefully planned and skillfully executed experiments he showed that the liver is able to store sugar in a form which he called glycogen and later to reconvert that substance into sugar and pour it into the general circulation. This paper is, therefore, not only one of Bernard's earliest scientific works but also is a landmark in the physiology of sugar metabolism and the glyco-genic function of the liver.

The second paper reproduced herein "Du suc pancréatique et de son rôle dans les phénomènes de la digestion" was published in 1849 and is the first of Bernard's works on the function of the pancreatic juice.

Before Bernard there had been many workers on the physiology of digestion. Even Aristotle recognized that food is mixed with a secretion in the mouth, partially digested in the stomach and the residue completely digested in the intestine. Galen thought that the heat of the body was one of the chief causes of digestion but his physiology is confounded by indefinite terminology. Paracelsus, Von Helmont and Sylvius added to the knowledge of digestion. One of the greatest contributors was Regnier de Graaf who, at the age of twenty-two, succeeded in establishing a fistula from the pancreas through the abdominal wall of a dog and in collecting pancreatic juice. However, his death at the age of thirty-two may have kept him from the discovery of the true function of pancreatic juice. Other works on the physiology of digestion in the two hundred years which separated de Graaf from Bernard were Stahl, Boerhaave, Haller, de Reaumer, Spallanzani and Prout.

One of the greatest investigators of digestion was the American army surgeon William Beaumont who in 1822 was able to study digestion directly in a large gunshot wound of the stomach of Alexis St. Martin. Beaumont for nearly two years carefully investigated the stomach juice, its appearance, rate of secretion and influence on different foods.

Eberle in 1834 suggested, and Valentin in 1844 saw, that pancreatic juice has an action upon starch but Bernard cleared up the whole problem with a series of clever experiments. He noticed that the lacteal vessels were engorged with fat just below the entrance of the duodenal duct. This led him to the conclusion that the pancreatic juice plays an important part in the digestion of fats. He stated that "gastric digestion is only a preparatory act," and proved that the fatty food passing through the intestine is emulsified by the pancreatic juice. Fatty acids and glycerin are the results of this emulsification. Bernard demonstrated the power of pancreatic juice to convert starch into sugar and to dissolve the proteids which had not been broken down in the stomach.

The two papers of Claude Bernard which appear here are thus samples of his early work on digestion and are not only landmarks

in the history of digestion but are also bases for our recognition of Bernard as one of the greatest physiologists of all time

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INDEX TO BIBLIOGRAPHY

	Reference	Year
Albumin in blood	155	1866
Alcohol, influence of	96	1856
Anatomy	157	1866
Anæsthesia	201	1876
	204	1876
Arthur de Bretagne	221	1887
Asphyxiation	166	1870
	167	1871
	171	1872
	191	1875

Claude Bernard

541

	Reference	Year
Atropine	27	1849
Bile, constitution of	22	1848
Blood, lectures on	85	1854
Blood, venous	112, 115, 116	1858
Brain, functions of	170	1872
Calf, two-headed	48	1849
Cerebellar peduncles	30, 32	1849
Chemical irritation	136	1859
Choledochus canal	8	1845
Chorda tympani	2	1843
Chyliferous vessels	57, 63	1850
Circulation	220	1884
Coloring substances	6	1844
Curare	42	1849
	60	1850
	62	1851
	100	1856
	134	1859
	149	1864
	152	1865
	179	1872
	196	1875
Diabetes	125	1859
	208	1877
Diabetic patient, autopsy	41	1849
Digestion	68	1852
Digestion, chemical phenomena of	5	1844
Digestion in herbivores and carnivores	9	1846
Digestion, stomachic	11, 12	1846
Dogs made diabetic	38	1849
Dura mater, degeneration of	65	1851
Electricity as excitant	109	1857
Endosmosis	84	1855
Ethnography	141	1862
Exophthalmos	175	1872
Experimental method	106	1857
Facial paralysis	2	1843
Fermentation, alcoholic	214, 217	1878
	218	1879

	Reference	Year
Fever	128	1859
Fevers, intermittent	14	1847
Fluids, properties of	121	1859
Gastric juice	1	1843
	209, 211	1877
Generation, spontaneous	117	1858
	118	1859
Glands, destruction of	80	1853
Glycogenic material	131	1859
	173, 174	1872
	208, 210	1877
Glycogenic material in fetus	127	1859
	184	1873
Glycemia	188	1874
	199, 200	1876
Heart, study of	151	1865
Heat	168	1871
	193	1875
	207	1877
Hermaphroditism, false	56	1850
Hunter's pliers	20	1854
Hydrogen sulphide, elimination of	103	1857
“ “ , harmlessness of	98	1856
Life	194	1875
Liver, alteration of	65	1851
Liver, function of	61	1850
	75	1853
	88	1855
	104	1857
	122	1859
Medicine, experimental	146	1864
	154	1865
	182	1873
Nerve, facial	7	1845
	107	1857
“ fifth pair	44	1849
“ pneumogastric	3	1844
	28, 34	1849
	78	1853
“ spinal	3	1844

Claude Bernard

543

	Reference	Year
nerve of kidney	186	1873
“ trigeminal	189	1874
Nerve influence on glands	113	1858
Nervous system	114	1858
	120	1859
Oculo-pupillary phenomena	143	1862
Opium	148	1864
Oxidation in blood	111	1857
Oxygen, absorption of	76	1853
Pancreas, comparative anatomy of	46	1849
“ destruction of	52	1849
“ function of	54	1850
Pancreatic juice	23	1848
	35	1849
	51	1849
	101	1856
Pathology, experimental	137	1860
Physiologic researches	4	1844
Physiology	64	1850
	94	1855
	114	1858
	126	1859
	130	1859
	138, 139	1860
	145	1862
	153	1865
	158, 159, 160	1867
	162	1868
	169	1871
	177	1872
	181	1873
	187	1874
Placenta, function of	119	1859
Raffalovich, Marie	216	1878
Reflex phenomena	71	1852
Saccharoid materials	198	1875
Saliva	15	1847
	72	1852
	108	1857

	Reference	Year
Salivary glands	69	1852
	172	1872
Science, experimental	213	1878
Secretions	147	1864
Sensibility	18, 19	1847
	202	1876
Sigmoid valvules	37	1849
Spinal cord, atrophy of	47	1849
Spleen, contractility of	49	1849
Strychnine, action of	17	1847
Sugar, assimilation of	45	1849
" in animal body	25	1848
	206	1876
" in blood	90	1855
" in intestine	43	1849
" in liver	24	1848
	91	1855
" in the egg	39	1849
" in urine, causes of	66	1851
" in urine of fetus	59	1850
" in vomitus	26	1849
" production of	33	1849
Surgery, operative	13	1846
Sympathetic system	67	1851
	70	1852
	74, 81	1853
	83	1854
	123, 132	1859
	142, 143	1862
Taste	7	1845
Temperature, animal	99	1856
	124	1859
Tissue, properties of	156	1866
Toxic substances	105	1857
Tuberculosis	82	1854
Urine, constitution of	22	1848
" elimination of	16	1847
Vaccine	164	1868

	Reference	Year
Vascular anastomosis	55	1850
Veins, communicating	40	1849
Water, injection of	50	1849
Works	219	1881
Xylidine	10	1846

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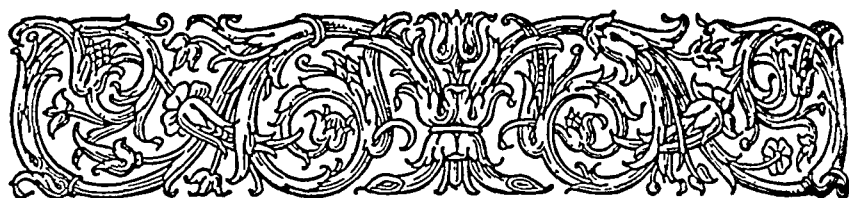
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De L'Origine Du Sucre Dans L' Économie Animale¹

PAR

LE DR CL BERNARD

*Professeur d'anatomie et de physiologie expérimentale, etc
Archives Générales de Médecine, 4 S, 18 303-319, 1848*

LE SUCRE est répandu avec profusion dans le règne végétal, mais il existe aussi dans les animaux. Les végétaux ne peuvent le trouver tout préparé dans la terre, et il est évident qu'ils le forment dans leurs organes. Chez les animaux, en est-il de même? ou bien le sucre qu'on rencontre dans leur corps est-il fourni exclusivement par les végétaux sucrés et amidonnés qui leur servent d'aliments? Telle est une question importante qui depuis longtemps préoccupe les physiologistes et les chimistes, et que nous allons chercher à résoudre expérimentalement.

Comme aliment, le sucre est une substance neutre qui est consommée par l'homme et les animaux sous des états différents. Les sucres qui habituellement peuvent être introduits dans le tube alimentaire sont 1° le sucre de canne, ou autrement dit *sucre de la première espèce*, qui se rencontre dans la canne à sucre, la betterave, la carotte, etc 2° Le sucre de raisin, ou *sucre de la deuxième espèce*, qui existe dans le raisin, les fruits sucrés, etc. La fécule, qui constitue une matière alimentaire très-abondante, doit être rapprochée des sucres, parce que par

¹ Travail présenté à la Société biologique, dans sa séance du 21 octobre 1848

suite des phénomènes digestifs, elle se change dans le canal intestinal en sucre de la seconde espèce 3° Le sucre de lait, qui existe dans le lait des animaux, etc.

Ce n'est point ici le lieu de tracer les caractères distinctifs de ces différents sucres ni de déterminer quels sont les changements et les transformations qu'ils doivent subir pour devenir aptes aux phénomènes ultérieurs de la nutrition. Je (p. 304) constate seulement que certains aliments étant susceptibles de fournir des quantités considérables de matière sucrée, on a pu les considérer comme la source unique d'où provenait le sucre qu'on rencontre dans le sang ou dans les fluides des animaux. C'est, en effet, à cette explication qu'on s'est arrêté dans les idées actuellement régnantes sur la nutrition. On admet aujourd'hui que le sucre n'existe dans le sang des animaux qu'à la condition que ceux-ci aient préalablement mangé des substances qui en contiennent ou qui soient capables d'en produire. Or, d'une part, les faits chimiques acquis apprennent qu'il n'y a que l'amidon, parmi les aliments, qui puisse se transformer en sucre, et d'autre part, rattachant cette question à cette idée ingénieuse que les animaux ne créent aucun principe immédiat et ne font que détruire ceux qui leur sont fournis par le règne végétal, on s'est cru suffisamment autorisé à refuser de la manière la plus explicite à l'organisme animal la faculté de faire du sucre, et on ne lui a reconnu que la seule faculté de le détruire et le faire disparaître. Les faits contenus dans ce travail et dont le détail va suivre nous montreront que la physiologie s'oppose à ce qu'on admette cette manière de voir.

1^{re} série d'expériences — On avait observé que, pendant la digestion d'une alimentation sucrée ou amylacée, le sang de l'homme et des animaux contenait du sucre, et on s'était appuyé sur ce fait pour en conclure que le sucre est fourni par les aliments. Le résultat expérimental, pris isolément, est exact, mais l'expérience est incomplète, et par suite la conclusion se trouve fautive, comme on va le voir.

1^{re} expérience. — Sur un lapin vivace, bien portant et de taille moyenne, ayant mangé du son et des carottes, j'ai encore ingéré dans l'estomac, à

l'aide d'une sonde, 30 gram d'amidon délayé dans un quart de litre d'eau bouillante puis refroidie

Cinq heures après, le lapin fut assommé par un coup sur la nuque, aussitôt j'ouvris la poitrine, et je recu illis environ 30 gram de sang qui s'écoula en divisant les cavités du cœur

(p 305) Après une heure, le sang était bien coagulé J'examinai alors le sérum limpide alcalin séparé du caillot, et j'y constatai la présence du sucre de la manière la plus positive¹

L'estomac et l'intestin contenaient du sucre provenant des carottes et de la transformation de l'amidon L'estomac, à réaction acide, contenait de l'amidou non transformé L'urine était trouble, alcaline, et ne renfermait pas de sucre

2^e *expér* — Un chien adulte et bien portant, à jeun depuis vingt quatre heures, mangea sans difficulté 300 gram de colle fraîche d'amidon prise chez l'épieier Cinq heures après, le chien fut assommé j'ouvris aussitôt la poitrine, et je recueillis le sang dans les cavités du cœur Après trois quarts d'heure, la coagulation étant opérée, je constatai la présence du sucre dans le sérum clair alcalin, qui s'était séparé du caillot sanguin

L'estomac, à réaction acide, contenait encore de l'amidon non transformé et à peine des traces de sucre Dans l'intestin, qui offrait une réaction alcaline, tout l'amidon était transformé, et on y trouva du sucre en grande quantité L'urine ne renfermait pas de sucre

3^e *expér* — Une chienne adulte et bien portante fit un repas copieux de tête de mouton cuite prise chez le tripier, et de plus quelques os de volaille Sept heures après, l'animal fut assommé La poitrine étant ouvert aussitôt, je recueillis le sang qui s'écoula de l'incision du cœur Après une heure et demie, je trouvai le sang coagulé, et un sérum opalin, lactescent, alcalin, s'était séparé Je l'examinai, et j'y constatai, d'une manière non équivoque, la présence du sucre L'animal était en pleine digestion intestinale Les matières renfermées dans l'estomac et l'intestin grêle avaient une réaction acide, et ne contenaient pas les moindres traces de sucre L'urine, à réaction acide, ne renfermait pas non plus de sucre

4^e *expér* — Un chien adulte et bien portant fut laissé sans nourriture Après deux jours d'une abstinence complète d'aliments solides et liquides, l'animal fut assommé La poitrine ouverte aussitôt, je

¹ Le procédé mis en usage pour rechercher le sucre sera exposé avec détail dans la 3^e série d'expériences

recueillis le sang dans les cavités du cœur, et une heure après, il s'était séparé du caillot un sérum limpide, non lactescent et alcalin, je l'examinai au réactif, et j'y constatai la présence du sucre avec la plus grande évidence

(p 306) L'estomac et l'intestin grêle, absolument vides et revenus sur eux-mêmes, ne renfermaient par conséquent pas de sucre. Il y avait dans le gros intestin un peu de matières fécales dures et noires. L'urine acide ne contenait pas de sucre.

Les expériences ci dessus rapportées ont été reproduites un grand nombre de fois avec des résultats semblables. Le fait général qui en découle est facile à saisir c'est qu'il existe constamment du sucre dans le sang des animaux avec tous les régimes alimentaires, et même avec celui de l'abstinence. On avait donc eu tort de s'appuyer sur la présence du sucre dans le sang pendant la digestion des féculents pour conclure qu'il venait des aliments, car si, pour les animaux qui font le sujet des 1^{re} et 2^e expériences, le sucre trouvé dans leur canal alimentaire peut nous rendre compte de celui qui était dans leur sang, il est évident que cette raison ne peut plus être valable pour l'animal de la 3^e expérience, qui n'avait mangé que de la viande et chez lequel on a constaté l'absence de matière sucrée dans les voies digestives. Pour l'animal de la 4^e expérience, à jeun depuis deux jours et ayant le canal alimentaire vide, la chose deviendrait encore plus difficile à expliquer.

Cet exemple pourrait être choisi parmi beaucoup d'autres pour montrer combien l'erreur peut devenir facile en physiologie, quand on ne se débarrasse pas des idées préconçues et quand on ne fait pas des expériences comparatives. En effet, si on eût eu moins de confiance dans la théorie qu'on voulait étayer, on ne se serait pas contenté d'examiner le sang des animaux en digestion d'aliments féculents ou sucrés, on aurait songé à examiner le sang comparativement dans d'autres alimentations, et on aurait sans doute, comme moi, été conduit à rechercher et à trouver la provenance du sucre chez les animaux qui ne mangent ni matière sucrée (p 307) ni amidon. L'exposé de cette recherche va faire le sujet de la 2^e série d'expériences.

2^e série d'expériences — D'où provient le sucre qui existe dans

le sang des animaux qui sont nourris avec de la viande ou bien qui sont soumis à l'abstinence? Telle est la question intéressante pour la solution de laquelle nous devons actuellement instituer des expériences nouvelles. Il était bien présumable que le sucre n'avait pas été fabriqué dans le cœur, où nous l'avons rencontré, mais qu'il n'y avait été que simplement transporté d'un point quelconque de l'organisme. Après quelques tâtonnements que je crois inutile de rapporter ici, je fus conduit à rechercher la source de ce sucre du côté des organes glandulaires de l'abdomen, et voici comment j'expérimentai

1^{re} expér—Un chien adulte et bien portant, ayant fait un repas copieux d'os et de débris de viande cuite, fut assommé sept heures après. Aussitôt j'ouvris l'abdomen, et je constatai les phénomènes qui accompagnent la digestion quand elle est en pleine activité, c'est-à-dire un état turgescent de tous les organes du bas-ventre, dans lesquels la circulation se faisait très-activement, et de plus, la réplétion des vaisseaux chylifères et du canal thoracique par un chyle blanc laiteux, bien homogène.

Je recueillis 1° le sang qui s'écoula de l'incision faite au tronc de la veine porte vers le point où la veine splénique vient s'y aboucher, 2° j'obtins du chyle en ouvrant le canal thoracique, 3° enfin, je pris du sang dans les cavités du cœur. Je séparai ensuite avec soin le contenu de l'estomac et de l'intestin grêle, et je recherchai la présence du sucre dans tous ces produits.

1° Les matières alimentaires contenues dans l'estomac et dans l'intestin grêle présentaient une réaction acide, et ne donnèrent pas aux réactifs la moindre trace de sucre.

2° Le chyle blanc rosé extrait du canal thoracique laissa séparer un sérum laiteux, alcalin, dans lequel je constatai l'absence du sucre.

3° Le sang de la veine porte s'étant coagulé, il s'en sépara un sérum opalin légèrement lactescent et alcalin, dans lequel je constatai la présence d'une très-grande quantité de sucre.

4° Le sang pris dans le ventricule droit du cœur se coagula bientôt (p. 308) en présentant un sérum alcalin et lactescent, dans lequel les réactifs, démontrèrent beaucoup de sucre, mais en moins grande abondance cependant que dans le sang de la veine porte.

2^e expér—Un chien adulte et bien portant fut tué au troisième jour d'une abstinence absolue. J'ouvris aussitôt l'abdomen, et je constatai

les phénomènes qui accompagnent l'inactivité des organes digestifs, savoir, un état de pâleur et d'anémie des organes du bas-ventre, et, de plus, la vacuité et la rétraction de l'estomac et des intestins. Les vaisseaux chylifères et le canal thoracique contenaient de la lymphe transparente avec un très-léger reflet opalin. Je recueillis séparément

1° Du sang du tronc de la veine porte. Je constatai très-nettement dans le sérum limpide alcalin qui s'en sépara la présence du sucre, quoiqu'il y fût en moins grande abondance que dans l'expérience précédente.

2° Du sang du ventricule droit. Dans son sérum limpide alcalin, la présence du sucre était indubitable.

3° De la lymphe du canal thoracique, dans laquelle je ne constatai pas la moindre trace de sucre.

Je répétai plusieurs fois ces expériences, dans des circonstances semblables, avec des résultats identiques et sans arriver à comprendre comment le sang de la veine porte pouvait contenir tant de sucre quand les intestins n'en renfermaient aucunement. Réfléchissant cependant qu'il fallait bien que ce sucre provînt de quelque organe voisin, attendu que les parois de la veine porte n'avaient probablement pas la propriété de le sécréter, je fis l'expérience suivante.

3^e expér.—Ayant tué aussi rapidement que possible, c'est-à-dire en quelques secondes, par la section du bulbe rachidien, un chien en digestion de matières alimentaires exemptes de sucre ou d'amidon, j'ouvris immédiatement la cavité abdominale, puis avec la plus grande célérité possible j'apposai des ligatures 1° sur des rameaux veineux qui émanaient de l'intestin grêle, non loin de cet intestin, 2° sur la veine splénique, à quelques centimètres de la rate, 3° sur les rameaux veineux émanant du pancréas, 4° sur le tronc de la veine porte, avant son entrée dans le foie. Incisant (p. 309) ensuite ces différentes veines derrière les ligatures que j'avais apposées, ou, autrement dit, entre la ligature et l'organe, je pus recueillir séparément le sang provenant de l'intestin grêle, de la rate, du pancréas, et celui qui reflua du foie. 1° Dans le sang des veines intestinales, de même que dans les matières contenues dans l'intestin, je constatai du sucre. 2° Le sang provenant de la rate ne contenait non plus aucune trace de sucre, 3° dans le sang des veines pancréatiques, je n'en trouvai pas davantage, 4° enfin, dans le sang qui

reflua en grande abondance des veines hépatiques, après l'ouverture du tronc de la veine porte au-dessus de la ligature, ce ne fut pas sans étonnement que je recontrai des quantités énormes de sucre. En voyant le sang du foie contenir autant de sucre, il était présumable que son tissu devait en renfermer. J'analysai donc une portion du foie de ce chien, et j'y trouvai des quantités très-considérables de sucre, tandis que la tissu de la rate, du pancréas, des ganglions mésentériques du même animal, également lavés et examinés avec soin, ne dénotèrent aucune trace de sucre aux réactifs.

Dès lors il fut évident que c'était du foie que le sucre provenait.

Mais comment, dira-t-on, le sucre se rencontrait dans le sang de la veine porte et dans les veines hépatiques, car en supposant qu'il fût formé dans le tissu du foie, le courant sanguin aurait dû l'emporter dans le sens des veines sus-hépatiques du côté du cœur, et l'empêcher de refluer par les veines hépatiques dans la veine porte. Cette remarque serait juste s'il s'agissait de la circulation générale, où l'on ne voit pas en effet le sang traverser, par un mouvement rétrograde, un tissu capillaire qu'il a déjà franchi dans un mouvement progressif. Mais pour le foie, il n'en est pas ainsi, et le reflux du sang des veines sus-hépatiques dans la veine porte est chose très-facile. Quant à la cause qui, dans mes expériences, a déterminé ce reflux du sang sucré du foie dans la veine porte, elle est très-facile à comprendre. En effet, la circulation du sang dans la veine porte, (p. 310) à l'état physiologique, est produite surtout par la pression exercée sur les viscères par les parois abdominales. Il en résulte que, le tronc et les rameaux de la veine porte étant naturellement comprimés, lorsqu'on vient à ouvrir le ventre, cette compression cesse par l'issue des viscères abdominaux. Si on ajoute que, par cette hernie des organes, les rameaux vasculaires se trouvent tirillés et allongés, on verra qu'à l'ouverture de l'abdomen il doit se faire une sorte de déplétion dans toute l'étendue de la veine porte et particulièrement dans les gros troncs. Cette sorte de vide aspire le sang du foie et des autres organes avec d'autant plus de facilité qu'il n'y a pas de valvules qui empêchent la marche rétrograde du sang. Je n'insiste du reste pas davantage sur ce point, sur lequel j'aurai l'occasion de revenir dans d'autres

circonstances J'indique seulement que, dans nos expériences, la présence du sucre dans la veine porte doit être regardée comme accidentelle, car j'ai pu l'éviter après en avoir connu la cause, en plaçant une ligature sur la veine porte à son entrée dans le foie, avant d'opérer le débridement ou l'éventration de l'animal D'où il suit qu'à l'état physiologique il n'existe pas de sucre dans le sang qui entre dans le foie

En résumé, par cette deuxième série d'expériences, nous avons appris qu'il existe du sucre en grande quantité dans le foie, que ce sucre se dissout ou se verse dans le sang qui traverse le foie, et se trouve ainsi apporté par les veines sus-hépatiques et la veine cave inférieure dans le cœur droit, où on le rencontre constamment

3^e série d'expériences.—Les faits exposés précédemment nous ont amené à trouver une source de sucre dans les animaux Cette découverte nous paraît trop importante pour que nous ne l'entourions pas de toutes les garanties possibles Nous allons donc indiquer les procédés que nous avons mis en usage (p 311) pour la recherche du sucre, afin que chacun puisse être à même de répéter les expériences, s'il le juge convenable

1^o Recherche du sucre dans le foie Il suffit de prendre une certaine quantité du tissu du foie, de le broyer dans un mortier ou autrement, après quoi on le fait bouillir pendant quelques instants avec une petite quantité d'eau, puis on filtre pour obtenir le liquide de la décoction Ce décoctum, qui ordinairement présente un aspect opalin, possède tous les caractères d'un liquide sucré 1^o Il brunit lorsqu'on le fait bouillir avec la potasse, et il réduit, dans de semblables circonstances, le tartrate double de potasse et le cuivre Si l'on ajoute de la levure de bière avec une température convenable, au bout de très-peu de temps la fermentation s'établit et marche activement On constate que c'est de l'acide carbonique qui se dégage, et lorsque la fermentation est achevée, si l'on distille le liquide restant, on obtient de l'alcool qui, suffisamment concentré par plusieurs distillations, s'enflamme et se reconnaît à tous ses caractères

Les proportions considérables de sucre qui se montrent dans le foie par les réactions ci-dessus indiquées font penser qu'on

peut arriver, en prenant une quantité suffisante de l'organe, à en extraire le sucre en nature. Le procédé le plus simple consisterait à prendre des décoctions ou macérations de foie suffisamment concentrées, à les traiter par l'alcool pour séparer les matières albuminoïdes, puis à évaporer rapidement à une chaleur douce jusqu'à consistance sirupeuse convenable pour obtenir la cristallisation. En opérant de cette manière ou par d'autres moyens analogues, il a bien été possible d'obtenir la concentration des liqueurs sucrées, mais jamais la cristallisation n'a pu s'effectuer. Cela vient de ce que le tissu du foie, outre des grandes quantités de matières grasses et albumineuses, contient encore des proportions énormes de sels et particulièrement de chlorure de sodium Si , par l'eau d'abord et ensuite par l'alcool suffisamment rectifié, (p. 312) on se débarrasse des premières substances, il devient extrêmement difficile d'opérer la séparation des sels qui, restant dans la dissolution sucrée, empêchent la cristallisation du sucre et constituent une véritable mélasse. Il serait peut-être d'un grand intérêt pour les chimistes de pouvoir, séparer et analyser le sucre du foie, mais, à mon point de vue, la chose ne me semble pas indispensable, parce que l'ensemble des caractères que nous avons donnés, surtout la fermentation avec formation d'acide carbonique et d'alcool, me paraît plus que suffisant pour établir l'existence du sucre dans le foie.

Lorsqu'on s'est livré à la recherche du sucre dans le foie, et qu'on voit que cette substance y existe en telle abondance que rien n'est si simple ni si facile que d'en constater la présence par la fermentation, on reste surpris que ce fait soit resté si longtemps inconnu. Le foie est, en effet, chose bien vulgaire et il suffit de prendre un morceau de cet organe chez un tripe pour voir tout ce que nous avons dit plus haut. Il est cependant une chose qui aurait dû frapper : c'est l'amertume extrême de la bile¹ et la saveur particulière sucrée du tissu du foie. Il est évident que l'amertume de la bile contenue dans les conduits hépatiques est tempérée ou masquée par le sucre du foie, et on

¹ La bile ne contient pas de sucre, la matière décrite sous le nom de sucre biliaire est un autre principe.

peut dire avec justesse que dans cet organe le miel se trouve à côté du fiel

La recherche du sucre dans le sang se fait très-simplement Lorsque le sang est extrait du cœur ou des vaisseaux, je le laisse coaguler, et prenant dans un tube fermé par un bout une partie du sérum qui s'est séparé, j'y ajoute environ un sixième en volume de tartrate double de cuivre et de potasse, puis, faisant bouillir le mélange, il s'opère (p 313) une réduction de sel de cuivre proportionnel à la quantité de sucre contenu dans le sérum Ce mode d'opérer, très-simple et très-rapide, dénote les moindres traces du sucre Quand on opère en faisant des expériences comparatives, on pourrait à la rigueur s'en tenir à ce caractère Cependant, si l'on désirait avoir plus de sécurité, on ajouterait de la levure de bière au sérum, et on recueillerait le gaz dans un appareil approprié Si la quantité de sucre dans le sérum n'était pas assez considérable pour donner des produits de fermentation assez nets, on coagulerait une suffisante quantité de sérum par l'alcool, puis on traiterait la dissolution alcoolique filtrée et concentrée suffisamment Il est en point qu'on ne doit jamais perdre de vue quand on recherche le sucre dans le sang, c'est que le sucre s'y détruit spontanément avec une grande rapidité, de sorte qu'il faut agir sur le sérum aussi vite que possible et immédiatement après sa séparation Si l'on voulait prévenir la destruction du sucre, on n'aurait qu'à coaguler le sang au sortir des vaisseaux par de l'alcool ou de l'acétate de plomb, alors la matière sucrée se conserverait parfaitement intacte dans la dissolution d'alcool ou d'acétate de plomb

Nous devons actuellement nous prononcer sur l'espèce de sucre qu'on rencontre dans le foie et dans le sang En rappelant les réactions qu'il nous a offertes on peut conclure que ce n'était ni du sucre de lait ni du sucre de canne Ce n'est pas du sucre de canne, parce qu'il brunit par la potasse et réduit les sels de cuivre, ce n'est pas du sucre de lait, parce qu'il fermente avec une grande rapidité Resterait donc le sucre de raisin ou glucose, dont le sucre de foie nous a présenté les caractères chimiques, quoique cependant il en diffère au point de vue physiologique Plus tard, dans un travail qui suivra celui-ci, en m'occupant du

mécanisme par lequel le sucre se détruit dans le sang, je montrerai que le sucre de diabète, qui a été considéré comme chimiquement (p 314) identique au sucre de raisin (glucose), en diffère notablement par certains caractères physiologiques. Or, je puis le dire par anticipation, le sucre qu'on rencontre dans le foie est du sucre de diabète.

4^e série d'expériences — Nous savons maintenant que le sucre qu'on concentre dans les corps des animaux se trouve spécialement concentré dans leur foie. Mais d'où provient-il définitivement? A cet égard, deux suppositions peuvent être faites ou bien il résulte directement d'une transformation particulière de certains éléments du foie, ou bien on peut encore admettre que le sucre est seulement déposé ou accumulé dans l'organe par suite des alimentations extérieures. En effet, les animaux nourris avec la viande ou mis à l'abstinence avaient peut-être, dira-t-on, mangé les jours précédents du pain ou du sucre, et comme ces substances, absorbées surtout par la veine porte, ont dû de toute nécessité traverser le tissu du foie, on pourrait admettre, dis-je, que le foie retient en partie ce sucre. On pourrait même ajouter, pour corroborer cette manière de voir, qu'il est déjà connu que le foie a la propriété de retenir ainsi l'arsenic et certains autres poisons métalliques, etc. Sans nier que le foie puisse jouer dans quelques cas le rôle d'organe condensateur, je dois dire que les expériences qui suivent ne sont pas favorables à cette manière de voir.

1^{re} expérience — Un chien adulte et bien portant a été mis à l'abstinence d'aliments solides et liquides pendant huit jours, après ce temps, l'animal a été nourri durant onze jours abondamment et exclusivement avec de la viande cuite (tête de mouton). Le 19^e jour de sa séquestration, l'animal a été tué, étant en pleine digestion. Son sang contenait beaucoup de sucre, et le tissu du foie en fournissait des quantités tout aussi abondantes que dans nos premières expériences.

(p 315) J'ai réitéré cette expérience trois fois de la même manière avec des résultats semblables.

Ces expériences ne permettent plus, ce me semble, de penser que le foie retient seulement le sucre des aliments, car après dix-neuf

jours, son élimination aurait certainement dû être effectuée, comme on va encore s'en convaincre par les faits qui suivent

2^e *expér* — Sur un lapin adulte et vigoureux, en pleine digestion d'herbes et de carottes, j'ai coupé les deux pneumogastriques dans la région moyenne du cou. Dix-sept heures après, l'animal fut trouvé mort et encore chaud. Je fis son *autopsie* avec soin, et je ne trouvai pas de trace de sucre ni dans le sang ni dans le foie. La bile, qui est habituellement alcaline chez ces animaux, était très-nettement acide et verdâtre.

3^e *expér* — Sur un chien adulte et vigoureux, en pleine digestion, je coupai les deux nerfs pneumogastriques dans la région moyenne du cou. Le chien mourut le 2^e jour, et son foie ni son sang, examinés aussitôt après la mort, ne dénotèrent au réactif la présence du sucre. La bile contenue dans sa vésicule était également acide.

L'effet de cette section des nerfs pneumogastriques sur les fonctions du foie, si le résultat se maintient en répétant les expériences, me paraît excessivement singulier. Il en résulterait, en effet, que cette formation de sucre dans le foie, qui est évidemment un fait chimique, se trouve directement liée à l'influence du système nerveux. D'une autre part ces expériences prouvent que l'élimination du sucre antérieurement contenu dans le foie a dû se faire très-rapidement, car alors on n'en trouve plus d'une manière sensible, lors même que les animaux en ont dans l'estomac (*expér* 2).

S'il était nécessaire de démontrer, par de nouveaux arguments, que la formation du sucre dans le foie est indépendante des aliments, je dirais que j'ai constaté, sur de jeunes veaux pris aux abattoirs, que le sucre existe dans le foie en très-grande (p. 316) proportion pendant la vie intra-utérine. Toutefois, ce n'est que vers le quatrième ou cinquième mois de la vie intra-utérine, que cette présence du sucre commence à se manifester dans le foie, et la proportion de ce principe augmente à mesure qu'on approche de la naissance.

De tout cela, je crois donc pouvoir conclure que le sucre se forme dans le foie, et que cet organe est en même temps le *siège* et l'*orgine* de la matière sucrée chez les animaux.

CONCLUSIONS ET RÉFLEXIONS

Les conclusions qui me paraissent découler des faits contenus dans ce mémoire sont

1° Qu'à l'état physiologique, il existe constamment et normalement du sucre de diabète dans le sang du cœur¹ et dans le foie de l'homme et des animaux

2° Que la formation de ce sucre a lieu dans le foie, et qu'elle est indépendante d'une alimentation sucrée ou amylacée

3° Que cette formation du sucre dans le foie commence à s'opérer dans l'animal avant la naissance, par conséquent avant l'ingestion directe des aliments

4° Que cette production de matière sucrée, qui serait une des fonctions du foie, paraît liée à l'intégrité des nerfs pneumogastriques

Il est évident que devant ces faits, cette loi, que les animaux ne créent aucun principe immédiat, mais ne font que détruire ceux qui leur sont fournis par les végétaux, doit cesser d'être vraie, puisque, en effet, les animaux à l'état (p 317) physiologique peuvent, comme les végétaux, créer et détruire le sucre

De ce que l'organisme animal produit du sucre sans amidon, ce que les moyens chimiques connus ne nous permettent pas de faire, je n'en conclurai pas qu'il faut diminuer l'importance des connaissances chimiques, dans l'étude des phénomènes de la vie. Je suis, au contraire, de ceux qui apprécient le plus tous les progrès que la chimie organique moderne a fait faire à la physiologie. Seulement je pense, ainsi que j'ai déjà eu l'occasion de le dire,² que pour éviter l'erreur et rendre tous les services dont elle est capable, la chimie ne doit jamais s'aventurer seule dans l'examen des fonctions animales, je pense qu'elle seule peut, dans beaucoup de cas, résoudre des difficultés qui arrêtent la physiologie, mais elle ne peut pas la devancer, et je pense enfin que, dans aucun cas, la chimie ne peut se croire autorisée à restreindre

¹ Nous verrons ultérieurement, en parlant de la destruction du sucre, qu'il peut avoir disparu avant d'arriver dans les veines superficielles du corps où l'on pratique habituellement la saignée

² *Expériences sur les manifestations chimiques diverses des substances introduites dans l'organisme (Archives génér de méd, 4^e série, 1848, t XVI)*

les ressources de la nature, que nous ne connaissons pas, aux limites des faits ou des procédés qui constituent nos connaissances de laboratoire

La question de l'origine du sucre dans les animaux, que nous venons d'examiner dans ce travail, est encore loin de nous être connue dans tous ses éléments. En effet, si nous possédons déjà des résultats bien positifs, il y a, d'un autre côté, des faits à élucider. Nous devons indiquer ces faits, afin de les signaler à l'étude et de montrer toute l'étendue de notre sujet, que nous n'avons fait qu'aborder dans ce premier travail.

D'après ce que nous avons dit sur l'existence du sucre dans (p. 318) le foie, il ne faudrait pas croire qu'en allant dans un amphithéâtre et qu'en prenant le foie d'un cadavre on y trouverait sûrement du sucre. Il existe, en effet, un grand nombre de maladies dans lesquelles le sucre disparaît et ne se retrouve plus dans le foie après la mort. Chez les diabétiques, on sait que le sucre disparaît des urines dans les derniers temps de la vie, il disparaît également du foie, car le foie d'un diabétique que j'ai eu l'occasion d'examiner sous ce rapport ne contenait pas de sucre. J'ai recherché le sucre dans les cadavres de 18 sujets morts de maladies différentes : il en est qui m'ont offert des proportions diverses de sucre, il en est d'autres qui n'en contenaient aucune trace. Mes observations sur ce point ne sont pas assez nombreuses pour que je puisse décider s'il y a des maladies où le sucre disparaît constamment, tandis qu'il persisterait dans d'autres. Chez les animaux affaiblis par une très-longue abstinence, devenus malades ou morts de maladie, le sucre diminue souvent d'une manière considérable ou même disparaît complètement. Tous les foies des animaux de boucherie doivent donc contenir beaucoup de sucre, s'ils ont été tués dans des conditions convenables. Les foies pris chez les tripiers m'ont toujours présenté une grande quantité de sucre. Enfin, il est une question que nous devons examiner avec soin : c'est de savoir s'il existe du sucre en même proportion chez toutes les classes d'animaux pris dans des conditions semblables autant que possible. Je

puis déjà affirmer qu'il paraît y avoir des différences à cet égard 1° chez les oiseaux (poulet, pigeon), la proportion de sucre est très-considérable 2° chez les mammifères (chien, lapin, porc, bœuf veau, cheval), la proportion de sucre est également très-considérable, 3° chez les reptiles (grenouille, lézard), la quantité de sucre trouvée dans le foie est très-faible, 4° dans les poissons, chez la raie et l'anguille, dont j'ai examiné le foie à l'état aussi frais, que possible, (p 319) je n'ai pas trouvé la moindre trace de sucre D'où vient cette disparition de sucre chez certains animaxu à sang froid? Cela tiendrait-il à l'énergie moins grande des phénomènes respiratoires, qui, ainsi que nous le verrons ultérieurement, sont dans un rapport très-intime avec la formation du sucre dans le foie?

FINI



The Origin of Sugar in the Animal Body¹

BY

CLAUDE BERNARD

Professor of Anatomy and of Experimental Physiology, etc
Archives Générales de Médecine, 48, 18 303-319, 1848

SUGAR is spread with profusion throughout the vegetable kingdom, but it also exists in animals. The vegetables are unable to find it all prepared in the earth, and it is evident that they form it in their organs. With animals, is it the same, or is it that the sugar which is encountered in their bodies is furnished exclusively by the sweet and starchy vegetables which serve them for food? Such is an important question, that for a long time has occupied physiologists and chemists, and which we shall attempt to solve experimentally.

As a food, sugar is a neutral substance which is consumed by man and the animals in different states. The sugars which may be introduced habitually into the alimentary tract are 1st, cane sugar, otherwise called "sugar of the first species", which is found in sugar-cane, the beet, the carrot, etc. 2nd, grape sugar, or "sugar of the second species", which exists in grapes, the sweet fruits, etc. Starch, which constitutes a very abundant alimentary material, may be compared to the sugars, because as the result of digestive phenomena, it is changed in the intestinal canal

¹ Work presented to the Société biologique, at its meeting on October 21, 1848

into sugar of the second species 3rd, milk sugar, which exists in the milk of animals, etc

This is not at all the place to trace the distinctive characters of the different sugars, nor to determine what are the changes and transformations which they must undergo to become qualified for the ulterior phenomena of nutrition I (p 304) merely state that certain foods being susceptible of providing considerable quantities of sugary material, they have been considered as the sole source whence comes the sugar which is encountered in the blood or fluids of animals It is, indeed, at this explanation that we have stopped, in the ideas ruling at present on nutrition It is admitted today that sugar does not exist in the blood of animals, except under the condition that they had previously eaten substances which contained it or were capable of producing it But, on the one hand, the acquired chemical facts inform us that there is only starch, among the foods, which may transform itself into sugar, and on the other hand, connecting this question with the ingenious idea that animals do not create any immediate principle and do nothing but destroy that which is provided by the vegetable kingdom, one feels sufficiently authorized to refuse in the most explicit manner to the animal organism the faculty of making sugar, and he has recognized in it only the faculty of destroying sugar and of making it disappear The facts contained in this work, the details of which will follow, show us that physiology is opposed to this point of view

First series of experiments It has been observed that during the digestion of a sweet or starchy food, the blood of man and the animals contains sugar, and the fact has been relied on to conclude that the sugar is furnished by the aliments The experimental result, taken as an isolated fact, is exact, but the experiment is incomplete, and consequently the conclusion is faulty, as will be seen

First experiment On a lively rabbit, healthy and of medium size, having eaten some bran and carrots, I also ingested into the stomach, with the aid of a sound, 30 gm of starch mixed with $\frac{1}{4}$ liter of boiled water which had been cooled Five hours later, the rabbit was killed

by a blow on the nape of the neck, immediately I opened the breast and collected about 30 gm of blood which ran out in dividing the cavities of the heart

(p 305) After one hour, the blood was well coagulated I then examined the clear alkaline serum which was separated from the curd, and in it I confirmed the presence of sugar in the most positive manner ¹

The stomach and the intestine contain sugar deriving from the carrots and the transformation of the starch The stomach, with acid reaction, contained unchanged starch The urine was cloudy, alkaline, and did not contain sugar

Second experiment An adult dog, healthy, fasting for 24 hours, ate without difficulty 300 gms of fresh starch paste, bought at the grocer's Five hours later, the dog was killed I immediately opened the chest, and collected the blood in the cavities of the heart After three quarters of an hour, coagulation having taken place, I confirmed the presence of sugar in the clear alkaline serum, which had separated from the blood clot

The stomach, with acid reaction, still contained starch which was unchanged and bare traces of sugar In the intestine, which offered an alkaline reaction, all the starch had been converted, and there sugar was found in great quantity The urine did not contain sugar

Third experiment An adult and healthy female dog made a big meal on cooked head of mutton, bought from the dealer in entrails, and in addition, some bones of fowl Seven hours later, the animal was killed The chest having been opened at once, I collected the blood which ran out of the incision of the heart After one and a half hours, I found the blood coagulated, and an opalescent, milky, alkaline serum had separated I examined it, and I established in an unequivocal manner the presence of sugar The animal was in full intestinal digestion The material found in the stomach and small intestine had an acid reaction and did not contain the least trace of sugar The urine, with acid reaction, did not contain any sugar either

Fourth experiment An adult and healthy dog was left without food After two days of complete abstinence from solid and liquid foods, the animal was killed The chest opened immediately, I collected the blood from the cavities of the heart, and one hour later it had separated into clot and a clear, non-milky, alkaline serum, I examined it with the

¹ The procedure used to determine the sugar will be given in detail in the 3rd series of experiments

reagent, and established the presence of sugar with the greatest evidence (p 306) The stomach and small intestine, absolutely empty and retracted on themselves, consequently did not contain sugar In the large intestine there was a little fecal matter, hard and black The acid urine did not contain sugar

The experiments reported above have been reproduced a large number of times with similar results The general fact which derives from them is readily grasped it is, that sugar constantly exists in the blood of animals with all alimentary regimens and also with abstinence It was a mistake, therefore, to rely on the presence of sugar in the blood during the digestion of starchy materials to conclude that it came from the food, because if, for the animals which were the subjects of the 1st and 2nd experiments, the sugar found in the alimentary canal could account for that which was in the blood, it is evident that this reason is no longer valid for the animal of the 3rd experiment, which had eaten only meat, and in which the absence of sugary material in the digestive tract had been established For the animal in the 4th experiment, fasting for two days and having the alimentary tract empty, the matter becomes still more difficult to explain

This example could be chosen from among many others to show how very easy error becomes in physiology, when one does not free himself of preconceived ideas and when one does not make comparative experiments Indeed, if one had had less confidence in the theory which he wished to support, he would not have contented himself with examining the blood of animals digesting starchy or sweet foodstuffs, he would have thought of examining the blood comparatively with other alimentations, and without doubt he would have conducted, as I have, a research to find the source of sugar in animals which eat neither sweetened material (p 307) nor starch The account of this research will be the subject of the second series of experiments

Second series of experiments Whence comes the sugar which exists in the blood of animals which are fed on meat or even are subjected to abstinence? That is the interesting question for the solution of which we must now institute new experiments It

was quite presumable that the sugar was not manufactured in the heart, where we found it, but that it had been quite simply transported from some point in the organism. After a few gropings which I think it unnecessary to report here, I was led to seek the source of the sugar among the glandular organs of the abdomen, and here is how I experimented

First experiment An adult and healthy dog, having made a big meal on bones and bits of cooked meat, was killed seven hours later. I opened the abdomen at once, and I found the phenomena which accompany digestion when it is in full activity, that is, a turgescient state of all the organs of the lower abdomen, among which the circulation was going forward very actively, and in addition, the repletion of the chyliferous vessels and of the thoracic duct by a white, milky chyle, quite homogeneous

I collected 1) the blood which flowed from the incision made in the trunk of the portal vein near the point where the splenic vein enters, 2) I obtained some chyle by opening the thoracic duct, 3) I took some blood from the cavities of the heart. Next, I separated with care the contents of the stomach and the small intestine, and I looked for the presence of sugar in all the products

1 The alimentary material contained in the stomach and in the small intestine showed an acid reaction, and with the reagents did not give the slightest trace of sugar

2 The pinky-white chyle extracted from the thoracic duct permitted the separation of a milky, alkaline serum, in which I established the absence of sugar

3 The blood of the portal vein having coagulated, there separated off an opalescent, slightly milky, alkaline serum, in which I verified the presence of a very large quantity of sugar

4 The blood taken from the right ventricle of the heart soon coagulated (p 308) and gave an alkaline and milky serum, in which the reagents demonstrated much sugar, but in lesser abundance than in the blood of the portal vein

Second experiment An adult and healthy dog was killed on the third day of an absolute abstinence. I opened the abdomen at once, and I found the phenomena which accompany the inactivity of the digestive organs, namely, a state of pallor and of anemia of the organs of the lower abdomen, and in addition, the vacuity and retraction of

the stomach and intestines The chyliferous vessels and the thoracic duct contained transparent lymph with a very slight opaline reflection I collected separately

1) Blood from the trunk of the portal vein I confirmed very clearly in the limpid alkaline serum which separated off, the presence of sugar, although it was in lesser abundance than in the preceding experiment

2) Blood from the right ventricle In its clear, alkaline serum the presence of sugar was indubitable

3) Lymph from the thoracic duct, in which I found not the least trace of sugar

I repeated these experiments several times, under similar circumstances, with identical results and without succeeding in understanding how the blood of the portal vein could contain so much sugar when the intestines did not contain any Reflecting that it must be that the sugar came from some nearby organ, considering that the walls of the portal vein probably did not have the property of secreting it, I made the following experiment

Third experiment Having killed as rapidly as possible, that is, in a few seconds, by section of the medulla oblongata, a dog in the process of digestion of food free from sugar and starch, I opened the abdominal cavity immediately, then with the greatest celerity possible I placed ligatures 1) on the venous branches which emanated from the small intestine, not far from the intestine, 2) on the splenic vein, a few centimeters from the spleen, 3) on the venous branches emanating from the pancreas, 4) on the trunk of the portal vein, before its entry into the liver Then incising (p 309) the different veins behind the ligatures which I had placed, or said in another way, between the ligature and the organ, I was able to collect separately the blood coming from the small intestine, from the spleen, from the pancreas, and that from the liver 1) In the blood of the intestinal veins, just as in the material contained in the intestine, I found sugar 2) The blood coming from the spleen no longer contained any trace of sugar, 3) in the blood of the pancreatic veins, I did not find any either, 4) finally, in the blood which flowed back in abundance from the hepatic veins, after the opening of the trunk of the portal vein above the ligature, it was not without astonishment that I found great quantities of sugar, although the tissue of the spleen, the pancreas, the mesenteric ganglia of the same animal,

equally washed and examined with care, did not indicate any trace of sugar with the reagents

Accordingly, it became evident that it was the liver from which the sugar proceeded

But how, one will say, is the sugar encountered in the blood of the portal vein and in the hepatic veins, for in supposing that it was formed in the tissue of the liver, the current of the blood should carry in the direction of the suprahepatic veins, towards the heart, and prevent it from flowing back by the hepatic veins into the portal vein. That remark would be correct if it concerned the general circulation, where one does not see the blood traverse, by a retrograde movement, a capillary tissue which it has already passed over in a progressive movement. But for the liver, this is not so, and the reflux of the blood of the suprahepatic veins into the portal vein is a very easy matter. As for the cause which, in my experiments, has determined the reflux of sugary blood from the liver into the portal vein, it is very easy to understand. Indeed, the circulation of the blood in the portal vein, (p 310) in the physiological state, is produced especially by the pressure exerted on the viscera by the abdominal walls. It therefore results that, the trunk and the branches of the portal vein being naturally compressed, when one goes to open the abdomen, this compression ceases due to the issue of the abdominal viscera. If one adds that, by this hernia of the organs, the vascular branches find themselves pulled and lengthened, one will see that the opening of the abdomen must make a sort of depletion throughout the entire extent of the portal vein, and particularly in the large trunks. This sort of vacuum aspirates the blood of the liver and of the other organs with even greater facility, since there are no valves to hinder the retrograde flow of the blood. I shall not insist any longer on this point, to which I shall have occasion to return in other circumstances. I only indicate that in our experiments, the presence of sugar in the portal vein should be regarded as accidental, because I have been able to avoid it after knowing the cause, by placing a ligature on the portal vein at its entry into the liver, before performing the debridement and

eventration of the animal From whence it follows that in the physiologic state, there is no sugar in the blood which enters the liver

As a résumé for this second series of experiments, we have learned that sugar exists in large quantity in the liver, that this sugar dissolves or pours itself out into the blood which passes through the liver and thus is carried by the supra-hepatic veins and the inferior vena cava into the right heart, where it is constantly found

Third series of experiments The facts reported above have led us to find a source of sugar in animals This discovery seems too important for us not to encircle it with all the guarantees possible We shall indicate, therefore, the procedures which we have used (p 311) for the investigation of sugar, so that everyone may be in a position to repeat the experiments, if he wishes to do so

1 Investigation of sugar in the liver It is sufficient to take a certain quantity of liver-tissue, to pulverize it in a mortar or otherwise, after which one boils it for a few moments in a small quantity of water, then filters it to obtain the liquid of the decoction This decoctum, which ordinarily presents an opaline appearance, possessed all the characters of a sweetened liquid 1st, it turns brown when one boils it with potash, and it reduces, in similar circumstances, the double tartrate of potash and of copper If one adds brewer's yeast with a suitable temperature, at the end of a very short time the fermentation is established and goes forward very actively It can be confirmed that carbonic acid is given off, and when the fermentation is complete, if the liquid is distilled, one obtains alcohol, which if sufficiently concentrated by several distillations, will burn and is recognized by all its characters

The considerable proportions of sugar which are shown in the liver by the above-indicated reactions, lead one to believe that he might succeed, by taking a sufficient quantity of the organ, in extracting from it the sugar in its natural form The most simple procedure would consist of taking decoctions or macerations of liver which are sufficiently concentrated, treating them with

alcohol to separate the albuminoid materials, then rapidly evaporating over a gentle heat to the syrupy consistency suitable to obtain crystallization. By working in this manner or by other analogous means, it has been possible to obtain the concentration of the sweetened liquor, but the crystallization has never been effected. That is due to the fact that the tissue of the liver, besides great quantities of fatty and albuminous materials, contains enormous quantities of salts, particularly sodium chloride. If, by water at first and then by sufficiently rectified alcohol, (p 312) one frees himself of the first substances, it becomes extremely difficult to obtain the separation of the salts, which by remaining in the sugar solution, prevent the crystallization of the sugar and form a veritable molasses. It would perhaps be of great interest for chemists to be able to separate and analyze the sugar in the liver, but, from my point of view, the matter is not indispensable, because the aggregate of characteristics which we have given, especially the fermentation and the formation of carbonic acid and of alcohol, seems to me more than enough to establish the existence of sugar in the liver.

When one has devoted himself to the investigation of sugar in the liver, and when he sees this substance exists there in such abundance, that nothing is more simple and easy than to confirm its presence by fermentation, he is surprised that this fact has remained so long unknown. The liver is indeed a very common affair, and it suffices to take a piece of this organ from the butcher's shop to see all that we have said above. However, there is one thing which should strike one—that is the extreme bitterness of the bile¹ and the particular sweet flavor of the tissue of the liver. It is evident that the bitterness of the bile contained in the hepatic ducts is tempered or masked by the sugar of the liver, and with accuracy one may say that in this organ honey finds itself beside gall.

The test for sugar in the blood is made very simply. After the blood has been extracted from the heart of the vessels, I let

¹ Bile does not contain sugar, the material described under the name of biliary sugar is another principle.

it coagulate, taking, in a tube which is closed at one end, a part of the serum which has separated, I add to it about one sixth in volume of double tartrate of copper and of potash, then, by boiling the mixture, there is (p 313) a reduction of the copper salt proportional to the quantity of sugar contained in the serum. This procedure, very simple and very rapid, shows the least trace of sugar. When one is working with comparative experiments, he may, if necessary, rely on this characteristic. Meanwhile, if he wished to have more security, he would add brewer's yeast to the serum, and would collect the gas in an appropriate apparatus. If the quantity of sugar in the serum was not sufficiently great to give fairly clear fermentation products, he would coagulate a sufficient quantity of the serum with alcohol, and then treat the alcoholic solution, which had been filtered and properly concentrated. There is a point which should never be lost to view when one tests for sugar in the blood, and that is that it is quickly and spontaneously destroyed, so that it is necessary to act on the serum as quickly as possible, and immediately after its separation. If one wishes to prevent the destruction of the sugar, he needs only to coagulate the blood on its leaving the vessels, by alcohol or by lead acetate, then the sugar material would be conserved perfectly intact in the solution in alcohol or lead acetate.

We must now express ourselves on the kind of sugar which is found in the liver and blood. In recalling the reactions which it gave, it could be concluded that it was neither milk sugar nor cane sugar. It is not cane sugar because it turns brown with potash and reduces the salts of copper, it is not milk sugar, because it ferments with great rapidity. There remains grape sugar or glucose, of which liver sugar has shown the chemical characters, although at the same time it differs from the physiological point of view. Later, in a work which will follow this, in applying myself to the mechanism by which sugar is destroyed in the blood, I shall show that the sugar of diabetes, which has been considered as chemically (p 314) identical with grape sugar (glucose), differs notably from it by certain physiological characters. Thus, I may say by anticipation, the sugar which is found in the liver is the sugar of diabetes.

Fourth series of experiments We know now that the sugar which is concentrated in the bodies of animals is found especially concentrated in their liver. But whence does it come definitely? In this regard, two suppositions may be made: either it results directly from a particular transformation of certain elements of the liver, or one may admit that the sugar is only deposited or accumulated in the organ as the result of exterior alimentations. Indeed, the animals fed on meat or put on abstinence perhaps had eaten, one might say, on the preceding days of bread or sugar, and as these substances, absorbed especially by the portal vein, must of necessity traverse the tissue of the liver, one could admit, I say, that the liver retains a part of this sugar. One could even add, to corroborate this point of view, that it is already known that the liver has the property of retaining in this manner arsenic and certain other metallic poisons, etc. Without denying that in certain cases the liver may play the rôle of condensing organ, I may say that the following experiments are not favorable to this manner of thinking.

First experiment An adult and healthy dog was put on abstinence of solid and liquid foods for 8 days, after this time, the animal was feed for 11 days, abundantly and exclusively with cooked meat (mutton head). The 19th day of its sequestration, the animal was killed during full digestion. The blood contained much sugar, and the tissue of the liver furnished quantities equally as great as in our first experiments.

(p. 315) I repeated this experiment three times in the same manner, with similar results.

These experiments no longer permit, it seems to me, of thinking that the liver only retains the sugar of foods, for after 19 days its elimination certainly would have been effected, as one may convince himself by the facts which follow.

Second experiment On an adult and vigorous rabbit, in the middle of digestion of grass and carrots, I cut the two pneumogastrics in the middle region of the neck. Seventeen hours later the animal was found dead and still warm. I performed its autopsy with care, and I did not find a trace of sugar either in the blood or in the liver. The bile, which is habitually alkaline in these animals, was very clearly acid and greenish.

Third experiment On an adult and vigorous dog, during digestion, I cut the two pneumogastric nerves in the middle region of the neck. The dog died the second day, and its liver nor blood, examined immediately after the death, showed no presence of sugar with the reagents. The bile contained in the gallbladder was equally acid.

The effect of this section of the pneumogastric nerves on the function of the liver, if the result is maintained in repeating the experiment, seems to me to be excessively singular. The result would be indeed, that this formation of sugar in the liver, which is evidently a chemical fact, is found to be directly connected to the influence of the nervous system. On the other hand, these experiments prove that the elimination of the sugar previously contained in the liver must have occurred very rapidly, because one no longer finds it with a sensitive method, even when the animals have it in the stomach (experiment 2).

If it were necessary to demonstrate by new arguments that the formation of sugar in the liver is independent of foodstuffs, I would say that I had established, with young calves taken at the slaughtering-houses, that sugar exists in the liver in very (p. 316) large proportion during the intrauterine life. However, it is not until the fourth or fifth month of the intra-uterine life that this presence of sugar begins to manifest itself in the liver, and the proportion of the principle increases as one approaches the birth.

From all this, I believe it is possible to conclude that sugar forms in the liver, and that this organ is at the same time the *seat* and the *source* of the sugar material in animals.

CONCLUSIONS AND REFLECTIONS

The conclusions which seem to me to derive from the facts contained in this memorandum are

1 That in the physiologic state, there exists constantly and normally the sugar of diabetes in the blood of the heart¹ and in the liver of man and animals.

2 That the formation of this sugar takes place in the liver, and that it is independent of a sweet or starchy alimentation.

¹ We shall see later, in speaking of the destruction of sugar, that it is able to disappear before arriving in the superficial veins of the body whence blood is usually drawn.

3 That this formation of sugar in the liver begins to operate in the animal before birth, and consequently before the direct ingestion of foodstuffs

4 That this production of sugary material, which would be one of the functions of the liver, appears to be bound to the integrity of the pneumogastric nerves

It is evident that before these facts, that law, that animals do not create any immediate principle, but only destroy those furnished them by the vegetables, must cease to be true, because animals in the physiologic state (p 317) are able, like the vegetables, to create and destroy sugar

Although the animal organism produces sugar without starch, something which the known chemical means do not permit us to do, I would not conclude therefore that the importance of chemical knowledge should be diminished in the study of the phenomena of life I am, on the contrary, one of those who appreciate the more all the progress that organic chemistry has caused physiology to make Only, I believe, as I have already had occasion to state,¹ that in order to avoid error and to render all the service of which it is capable, chemistry should never go adventuring alone in the examination of animal functions, I believe that it alone can solve, in many cases, the difficulties which deter physiology, but it cannot precede the latter, and I think, finally, that in no case may chemistry believe itself authorized to restrain the resources of nature, which we know not, to the limits of the facts or procedures which constitute our knowledge of the laboratory

The question of the origin of sugar in the animals, which we have just examined in this work, is still far from being known to us in all its elements Indeed, if we already possess very positive results, there are, in another direction, facts to elucidate We should indicate these facts, in order to point them out for study and to show the extent of our subject, which we have only skirted in this first work

According to what we have said about the existence of sugar in

¹ *Experiments with the different chemical manifestations of substances introduced into the body* Archives génér de méd, 4 s, Vol 16, 1848

(p 318) the liver, it should not be believed that in going into an amphitheater and in taking the liver of a cadaver, one would surely find sugar in it. There are, indeed, a large number of diseases in which the sugar disappears and is no longer found in the liver after death. In diabetics, it is known that the sugar disappears from the urine in the last period of the life, it disappears equally from the liver, because the liver of a diabetic which I had occasion to examine in this connection contained no sugar. I have investigated the sugar in the cadavers of 18 subjects who died of different diseases: there were some who showed different proportions of sugar, and there were others who did not contain a trace. My observations on this point are not numerous enough so that I may decide if there are diseases in which the sugar constantly disappears, while it persists in others. In animals weakened by a very long abstinence, which have become sick or have died of disease the sugar often diminishes considerably, and even disappears completely. All the livers of butchered animals, however, should contain much sugar, if they were killed under proper circumstances. The livers obtained at the butcher's have always given me large quantities of sugar. Finally, there is a question which we should examine with care: it is to know whether sugar exists in the same proportion in all classes of animals, taken in conditions as similar as possible. I may already affirm that there seem to be differences in this regard: 1) in birds (chicken, pigeon) the proportion of sugar is quite considerable, 2) in mammals (dog, rabbit, pig, beef, calf, horse) the proportion of sugar is also quite considerable, 3) in reptiles (frog, lizard) the quantity of sugar found in the liver is very small, 4) in fish, in the ray and the eel, the livers of which I examined in as fresh a state as possible, (p 319) I did not find the least trace of sugar. Whence comes this disappearance of sugar in certain cold-blooded animals? Is that related to the lesser energy of the respiratory phenomena, which, as we shall see later on, are in very intimate relation with the formation of sugar in the liver?

Du Suc Pancréatique et de son Role dans les Phénomènes de la Digestion

PAR

LE DR CL BERNARD

Professeur d'anatomie et de physiologie expérimentale, etc.

(Mémoire lu à la Société de biologie)

DEPUIS longtemps les anatomistes considèrent le pancréas comme une glande salivaire abdominale. Guidés sans doute par la même induction et aussi par des expériences insuffisantes, quelques physiologistes ont donné au suc pancréatique les attributs de la salive. Cette comparaison entre le pancréas et les glandes salivaires est fausse, et elle est bien loin d'exprimer les usages du suc pancréatique dans la digestion tels que je vais les établir.

Je me propose pour but, dans ce travail, de démontrer expérimentalement que le fluide pancréatique est destiné, à l'exclusion de tous les autres liquides intestinaux, à modifier d'une manière spéciale, ou autrement dit, à digérer les matières grasses neutres contenues dans les aliments, et à permettre (p. 61) de cette manière leur absorption ultérieure par les vaisseaux chylifères¹.

Je ne raconterai pas ici comment et par quelle série de faits j'ai été amené à découvrir ce rôle remarquable et imprévu de

¹ Les premiers résultats de mes recherches sur le pancréas sont consignés dans le journal *l'Institut*, au commencement de l'année 1848.

la glande pancréatique Je dirai seulement que ce n'est qu'à près une étude longue et attentive sur la nature vivante que je suis parvenu à déterminer nettement les conditions expérimentales des phénomènes physiologiques que je vais décrire J'indiquerai donc d'abord avec soin, quoique brièvement, les circonstances variables de l'expérimentation qui peuvent modifier les propriétés du suc pancréatique, afin que les résultats que j'annoncerai soient faciles à reproduire pour quiconque voudra répéter mes expériences

§I^{re} De l'extraction du suc pancréatique et des conditions de sa sécrétion

1^{re} EXPÉRIENCE — *Au début de la digestion* Une très-grosse chienne de chasse, épagneule, à jeun depuis douze heures et bien portante, fit, à sept heures du matin, un repas de viande assez copieux, après quoi elle but de l'eau Presque aussitôt que l'ingestion des aliments fut terminée, l'animal fut placé sur une table afin de lui extraire son suc pancréatique Je suivis à cet effet le procédé expérimental ordinaire, c'est-à-dire que je pratiquai dans l'hypochondre droit, au-dessous du rebord des côtes, une incision qui me permit d'amener au dehors le duodénum et une partie du pancréas Le tissu du pancréas était d'une coloration rosée légère, et ses vaisseaux étaient modérément gonflés par le sang Le duodénum était vide d'aliments, et aucun chylifère blanc n'y était visible J'isolai aussi rapidement que possible le plus volumineux des deux conduits pancréatiques qui, chez le chien, s'ouvre isolément et obliquement dans le duodénum, à 2 centimètres environ plus bas que le canal cholédoque Ce conduit, d'un blanc nacré et de la grosseur d'une forte plume de corbeau, était gonflé par du (p 62) liquide A chaque effort que faisait l'animal en criant, la quantité de liquide affluait plus considérable, et le canal devenait plus distendu J'ouvris alors le conduit pancréatique avec la pointe de ciseaux fins, et immédiatement il s'en écoula par grosses gouttes perlées du suc pancréatique incolore, limpide, offrant une consistance visqueuse et filante En ouvrant le conduit du pancréas vers son insertion sur le duodénum, il s'écoula aussi un peu de sang par suite de la lésion de petits vaisseaux voisins Mais ce qu'il y eut alors de remarquable, c'est que le suc pancréatique ne se mélangea pas avec le sang, et qu'il en resta isolé à la manière d'un liquide buileux ou d'une dissolution fortement gommée

J'introduisis alors dans le conduit, pancréatique ouvert un petit tube d'argent de 3 millimètres de diamètre et de 5 centimètres de longueur, que je fixai à l'aide d'un fil préalablement passé sous le conduit. Puis ayant fait rentrer dans l'abdomen le duodénum et le pancréas, je fermai la plaie par une suture en ayant soin de laisser sortir au dehors l'extrémité libre du tube d'argent, à l'aide duquel je devais recueillir le fluide pancréatique. En effet, presque immédiatement du liquide pancréatique s'écoula par le tube sous formes de grosses gouttes filantes, limpides, se succédant avec plus de rapidité quand l'animal faisait un effort, et offrant une réaction très-alkaline au papier de tournesol.

Après avoir constaté la réaction alcaline des premières gouttes de suc pancréatique, je fixai pour le recueillir une petite vessie de caoutchouc sur le tube, cette petite vessie avait été préalablement comprimée de manière à en chasser l'air et à faire aspiration sur le liquide par la tendance des parois de caoutchouc à reprendre leur forme arrondie. L'animal, étant ensuite délié et remis en liberté, alla se coucher dans un coin du laboratoire, où il resta tranquille sans présenter aucun phénomène fâcheux.

La petite vessie fut appliquée au tube à sept heures et demie du matin, je revins au laboratoire à une heure de l'après midi (par conséquent, cinq heures et demie après). Je trouvai le chien calme et toujours couché. Je détachai alors la petite vessie gonflée par du liquide, et je constatai qu'elle contenait 8 grammes 7 décigrammes de suc pancréatique limpide, incolore, onctueux, filant et ramenant fortement au bleu le papier de tournesol rougi. Du liquide offrant les mêmes caractères s'écoulait toujours goutte à goutte par le tube sur lequel je replaçai la petite vessie de caoutchouc. A cinq heures du soir, je retirai de nouveau la petite vessie, (p 63) 8 grammes juste de suc pancréatique bien alcalin et offrant les caractères précédemment indiqués.

Le lendemain dans la matinée, deuxième jour de l'opération, le suc pancréatique coulait en abondance, et les gouttes se succédaient rapidement. J'obtins de la même manière, et dans l'espace d'une heure et quart, 16 grammes de suc pancréatique qui était évidemment modifié. Ce liquide toujours fortement alcalin était fluide comme de l'eau, et avait perdu toute la viscosité qu'il avait la veille, de plus, il était légèrement opalescent, et laissait déposer un petit nuage tomenteux au fond du verre. Dans la soirée, le tube d'argent tomba avec la ligature.

L'animal ne mangea rien, il ne fit que boire abondamment, il avait de la fièvre, et la plaie était très-enflammée

Le troisième jour de l'opération, le chien but du lait. La plaie du ventre entra en suppuration, et au bout de huit à neuf jours, elle fut entièrement cicatrisée et le chien parfaitement guéri

L'expérience que je viens de rapporter fournit un exemple de la plus grande réussite possible. En effet, l'opération a été rapide, le pancréas n'a été attiré au dehors que dans une petite portion de son étendue, et il n'est pas resté exposé à l'air plus de cinq à six minutes, temps qui a été nécessaire pour trouver le conduit pancréatique, l'isoler, l'ouvrir, et y fixer le tube d'argent. Le tissu du pancréas n'était que légèrement turgide, l'animal était au début de la digestion, et c'est dans cette condition que j'ai toujours pu obtenir les quantités les plus considérables de suc pancréatique. Nous avons recueilli, depuis sept heures et demie du matin jusqu'à cinq heures du soir, 16 grammes 7 décigrammes de suc pancréatique, ce qui fait en moyenne presque 2 grammes par heure. Le lendemain, après le développement des symptômes inflammatoires de la plaie, nous avons obtenu 16 grammes du même fluide en une heure et un quart. La quantité de la sécrétion était donc considérablement accrue, mais le suc pancréatique offrait alors une très-grande fluidité et était profondément modifié dans ses propriétés physiologiques, ainsi que nous le verrons plus loin.

(p 64) 2^e EXPÉR — *En pleine digestion*. Sur un gros chien très-vivace, ayant fait un repas de viande quatre heures avant, et se trouvant en pleine digestion, j'ai attiré le pancréas au dehors de la même manière que dans l'expérience précédente, après quoi, j'ai isolé son conduit sur lequel a été fixé un tube d'argent de 3 millimètres de diamètre. Le pancréas était gorgé de sang, ses vaisseaux étaient turgescents, et son tissu présentait une coloration rouge intense. Le duodénum contenait des aliments, et à sa surface rampaient des vaisseaux chylifères nombreux pleins de chyle blanc et homogène. Les parties étant rentrées dans l'abdomen et environ deux minutes après l'apposition du tube sur le conduit pancréatique, il s'en écoula une goutte de suc pancréatique limpide d'un aspect visqueux et gluant, et offrant au papier de tournesol une réaction alcaline très-marquée. Il coulait ainsi 2 ou 3 gouttes de

fluide pancréatique par minute J'appliquai, à onze heures du matin, la petite vessie de caoutchouc sur le tube d'argent, et je revins au laboratoire six heures après Je retirai alors de la vessie 5 grammes de suc pancréatique, limpide, visqueux, d'aspect gluant, et ramenant fortement au bleu le papier de tournesol rouge Le lendemain (2^e jour de l'opération), je pus recueillir dans la matinée environ 25 grammes de suc pancréatique Mais ce suc du lendemain, plus abondant que celui de la veille, était devenu trèsfluide, dépourvu de viscosité, légèrement opalin et offrait toujours une réaction alcaline très-marquée au papier de tournesol La plaie de l'abdomen était sensible et enflammée Les jours suivants, ces symptômes disparurent, la plaie se cicatrisa, et le chien fut promptement guéri

Cette deuxième expérience a été faite rapidement et dans de bonnes conditions Elle ne diffère de la première qu'en ce que l'animal était en pleine digestion, au lieu d'être au début Si nous résumons les résultats obtenus, nous voyons 1^o que dans cette expérience pendant la digestion, le pancréas était turgide, gonflé de sang, et comme érectile, 2^o que la quantité de suc pancréatique fournie a été moins abondante, 3^o que le lendemain, après le développement de l'inflammation dans la plaie, la sécrétion pancréatique a été augmentée, et que le suc devenu plus aqueux était évidemment modifié

(p 65) 3^e EXPÉR — *Pendant l'abstinence* Sur un chien de taille moyenne et bien portant, à jeun depuis vingt-quatre heures, j'attirai au dehors une partie du pancréas par une petite plaie faite dans l'hypochondre droit La première chose qui me frappa fut l'extrême pâleur du pancréas, cet organe était comme exsangue, ses vaisseaux peu développés, et la couleur de son tissu se rapprochait de la blancheur du lait Le canal pancréatique était vide et aplati je l'incisai, rien ne s'en écoula, j'y plaçai comme à l'ordinaire un petit tube d'argent, après quoi je rentrai dans le ventre la portion de pancréas herniée, puis je fermai la plaie par une suture J'observai pendant dix minutes, et rien ne s'écoula par l'extrémité du tube d'argent Après ce temps, j'y fixai la petite vessie de caoutchouc Trois heures après, je l'enlevai, elle était vide, et à peine ses parois étaient humectées par des traces du suc pancréatique Cependant une goutte de liquide s'étant formée au bout du tube, je pus nettement constater l'aspect gluant et filant et la réaction alcaline du fluide pancréatique Pendant le reste de la

journée, il ne s'écoula que quelques gouttes très-rares de suc pancréatique avec les caractères que je viens de signaler. Le lendemain soir (trente heures environ après l'opération), la sécrétion pancréatique était devenue excessivement abondante, et il s'écoulait avec rapidité par le tube d'argent des gouttes d'un liquide incolore, dépourvu de viscosité, fluide comme de l'eau, et offrant une réaction très-franchement alcaline au papier de tournesol. Je recueilli environ 18 grammes de ce suc pancréatique en une heure. Les bords de la plaie étaient tuméfiés et enflammés. Le lendemain, le tube d'argent tomba avec sa ligature, et quelques jours après le chien était parfaitement guéri.

Cette expérience, qui a également été faite rapidement et dans de bonnes conditions, nous démontre que pendant l'abstinence le tissu du pancréas est blanc, exsangue, en même temps que son conduit est vide et aplati. La quantité de suc pancréatique qu'on peut recueillir à ce moment est excessivement faible et insuffisante pour les expérimentations. Le lendemain, lorsque l'inflammation de la plaie se fut manifestée, la sécrétion pancréatique devint très-active, mais ce suc n'avait pas ses caractères normaux et était altéré.

Ainsi donc, dans des expériences faites dans des conditions (p. 66) expérimentales aussi bonnes que possible, il peut se faire qu'on obtienne des quantités variables de suc pancréatique suivant que l'animal sera dans l'abstinence ou dans une période différente de la fonction digestive. Mais l'expérimentation mal faite peut également de son côté modifier la sécrétion pancréatique.

4° et 5° EXPÉR. — *Irrégulièrement faites*. 1° Sur un chien de taille moyenne, vigoureux et très-indocile, étant en digestion, j'appliquai comme à l'ordinaire le tube d'argent au canal pancréatique, mais il y eut, au moment de l'issue du pancréas, par la plaie, une hernie considérable des autres viscères abdominaux. La réduction en fut très-longue et très-difficile, à cause des efforts constants que l'animal faisait en se débattant. Il s'en suivit que le pancréas et une partie des intestins restèrent pendant longtemps exposés à l'air, et que ces organes se trouvèrent ensuite plus ou moins malaxés avant d'arriver à les faire rentrer dans le ventre. Après cette opération laborieuse, le chien paraissait mal à son aise, et il fut pris de vomissements. Rien ne coula par le tube d'argent, et la sécrétion pancréatique fut complète-

ment suspendue pendant quatre ou cinq heures Après ce temps, deux ou trois gram d'un fluide alcalin, mais sans viscosité et légèrement trouble, purent être obtenues c'était du suc pancréatique altéré Les jours suivants, le chien fut affecté d'une violente péritonite dont cependant il ne mourut pas

2° Sur un autre chien, également en digestion, l'incision dans l'hypochondre droit avait été faite trop petite, si bien que le pancréas et la portion de duodénum attirés au dehors furent comprimés et étranglés par le pourtour de la plaie Par l'obstacle au retour du sang veineux, ces organes deviennent rapidement turgides et violacés, et la recherche du conduit pancréatique fut par cela rendue plus longue et plus difficile Ce qu'il y eut de particulier dans cette expérience, c'est qu'en ouvrant le canal pancréatique, il en sortit deux ou trois gouttes d'un suc qui était rougeâtre, au lieu d'être incolore et limpide comme à l'ordinaire Après avoir réduit les organes et cousu la plaie, il s'écoula par le tube d'argent, en quatre heures environ, 1 gramme de suc pancréatique légèrement visqueux, alcalin, mais présentant toujours une coloration rougeâtre anormale Le fluide pancréatique qui fut recueilli ensuite était (p 67) devenu incolore et présentait à peu près ses caractères normaux, toutefois sa viscosité était moins grande Tout le reste de l'expérience se passa comme à l'ordinaire et le chien guérit

Depuis deux ans, pour répéter mes expériences dans mes cours ou pour les montrer aux savants qui désiraient les voir, j'ai extrait du suc pancréatique sur trente-quatre chiens Toutefois je me suis borné à rapporter les sept expériences qui précèdent, parce qu'elles résument à peu près toutes les circonstances de l'expérimentation nécessaires à connaître Or, de ces expériences il résulte que lorsqu'on voudra obtenir la plus grande quantité de suc pancréatique possible, il faudra prendre un chien au début de sa digestion De plus, il faudra faire l'expérience avec célérité et laisser le pancréas exposé à l'air le moins longtemps possible Dans ces conditions, la sécrétion du suc pancréatique n'est pas suspendue par l'opération, et la quantité qu'on peut en obtenir avant le développement des conditions morbides ne m'a jamais paru dépasser 2 grammes par heure sur un gros chien Cette quantité devient bien moindre si l'expérience est faite avec lenteur et dans de mauvaises conditions Mais une autre circonstance bien importante et qui n'a pas été signalée, c'est que

la sécrétion pancréatique augmente considérablement au moment où survient l'inflammation consécutive du pancréas. Quelquefois ce phénomène se manifeste peu de temps après l'opération ou bien n'arrive que le lendemain ou même le surlendemain. Mais cette sécrétion altérée est, ainsi que nous le verrons, dépourvue des propriétés physiologiques du suc pancréatique normal.

Il était donc bien important de pouvoir éviter ces difficultés et ces causes d'incertitude dans l'extraction du suc pancréatique. J'ai pensé pour cela à établir des fistules paneréatiques, mais pour arriver à ce but, j'ai rencontré des difficultés incroyables. Le canal pancréatique divisé se rétablit en quelques jours, de sorte que, pour maintenir l'écoulement (p. 68) du liquide au dehors, il m'a fallu faire usage d'un appareil tout à fait spécial. J'ai pu assez facilement obtenir l'évacuation permanente du fluide pancréatique au dehors, mais alors, quoique les animaux continuassent à manger, ils ne résistaient pas à la déperdition incessante du liquide pancréatique, et ils mouraient au bout de dix ou quinze jours dans le marasme et dans l'amaigrissement le plus étonnant. En définitive, il me fallut arriver à construire un appareil combiné de telle sorte qu'on pût, à volonté, tirer le suc pancréatique et le rendre à l'animal hors le temps de l'expérimentation. J'ai finalement réussi après deux ans de patience, mais comme cet appareil s'applique également au canal cholédoque, j'en donnerai la description ultérieurement en m'occupant du rôle de la bile et du suc pancréatique réunis dans les phénomènes de la digestion.

§II — *Caractères physiques et chimiques du suc pancréatique*

D'après ce qui a été établi précédemment, nous distinguerons deux sortes de suc pancréatique : 1° le suc pancréatique *normal*, obtenu dans de bonnes conditions, avant que l'inflammation se soit emparée du pancréas, ou bien recueilli chez un chien qui possède une fistule pancréatique, 2° le suc pancréatique *morbide*, qui est sécrété habituellement en grande abondance au moment où les symptômes de réaction inflammatoire se manifestent dans le pancréas et dans la plaie du ventre.

Le suc pancréatique *normal* est un liquide incolore, limpide,

visqueux et gluant, coulant lentement par grosses gouttes perlées ou sirupeuses, et devenant mousseux par l'agitation. Ce fluide est sans odeur caractéristique, placé sur la langue, il donne la sensation tactile d'un liquide visqueux, son goût a quelque chose de salé qui est très-analogue à la saveur du sérum du sang — J'ai constamment recontré (p. 69) la réaction du suc pancréatique très-manifestement alcaline, je ne l'ai jamais, dans aucun cas, trouvée neutre, ni acide — Le liquide pancréatique normal, exposé à la chaleur, se coagule en masse et se convertit en une matière conrète d'une grande blancheur. La coagulation est enitière et complète comme s'il s'agissait du blanc d'œuf tout devient solide, et il ne reste pas une seule goutte de liquide libre. Cette matière blanche du suc pancréatique est également précipitée par l'acide azotique ainsi que par l'acide sulfurique et par l'acide chlorhydrique concentré. Les sels métalliques, l'esprit de bois, et l'alcool, précipitent encore d'une manière complète la matière organique du suc pancréatique. Les acides acétique, lactique et chlorhydrique, étendus, ne coagulent pas le suc pancréatique. Les alcalis n'y produisent non plus aucun précipité, et ils redissolvent la matière organique quand elle a été préalablement coagulée par la chaleur, les acides ou l'alcool.

En résumant ces caractères du suc pancréatique, il semble bien qu'on soit en droit d'en conclure, ainsi que cela a été déjà fait par M. Magendie, MM. Tiedemann et Gmelin, etc., que le fluide pancréatique se comporte à la manière des liquides albumineux. En effet, une matière soluble qui se coagule par la chaleur et les acides énergiques possède bien les caractères de l'albumine. Cependant il n'y a aucun rapport sous le point de vue physiologique, ainsi que nous le verrons, entre le suc pancréatique et un liquide albumineux. Or, comme je prouverai que c'est ce principe coagulable qui est le principe actif, j'arrive forcément à conclure que la matière du suc pancréatique n'est pas de l'albumine physiologiquement, malgré qu'elle en offre les caractères chimiques. Je dirai cependant que cette identité n'est pas complète, car j'ai pu trouver des caractères pour distinguer chimiquement la matière pancréatique de l'albumine, je me bornerai à citerle suivant. Lorsque la matière du suc

pancréatique a été coagulée (p 70) par l'alcool, puis desséchée, elle se redissout en totalité et avec facilité dans l'eau,¹ tandis que l'albumine, traitée de la même manière, ne se redissout plus dans l'eau d'une façon appréciable

Le suc pancréatique *morbide* est un liquide de consistance aqueuse, dépourvu de viscosité, habituellement incolore, mais souvent opalescent, et quelquefois coloré en rougeâtre. Ce fluide présente une saveur salée et nauséuse en même temps, sa réaction s'est toujours montrée alcaline, sa densité est moins grande. Traité par la chaleur et les acides, il ne se coagule plus — La transformation du suc pancréatique *normal* en suc pancréatique *morbide* ne se fait pas brusquement, elle arrive au contraire d'une manière graduelle, de sorte qu'entre les caractères assignés au suc pancréatique *normal* et *morbide* on peut trouver beaucoup d'intermédiaires. Toutefois ces variations ne portent que sur la présence de la matière active coagulable, qui est très-abondante dans le premier suc pancréatique retiré après l'opération bien faite, tandis que la proportion de cette même matière diminue progressivement à mesure qu'on s'éloigne de ce moment, et peut manquer complètement lorsque l'inflammation s'est emparée franchement du tissu pancréatique. A mesure que cette matière disparaît, le suc pancréatique devient de plus en plus aqueux et perd son activité. Tout cela peut encore se résumer en disant que le suc pancréatique est d'autant plus normal et plus actif qu'il se coagule davantage par la chaleur, et qu'il est d'autant plus inerte et plus altéré qu'il se coagule moins.

Le suc pancréatique est sans contredit le plus altérable de tous les liquides de l'économie. Lorsqu'on expose du suc (p 71) pancréatique normal à une température basse (5 à 10° + 0), il peut être conservé plusieurs jours, et alors on remarque que par l'abaissement de température la viscosité du liquide augmente, et qu'il devient d'une consistance analogue à celle d'une gelée légère. Si au contraire on maintient le suc pancréatique à la température de 40 à 45°, il se modifie rapidement, et au bout de

¹ Et elle donne à l'eau la viscosité particulière du suc pancréatique et ses propriétés physiologiques, de sorte que c'est bien là la matière active du suc pancréatique

quelques heures, il est complètement altéré, c'est-à-dire qu'il répand une odeur nauséuse, qu'il présente un dépôt nuageux, et perd la propriété de se coaguler par la chaleur. La réaction alcaline du liquide persiste toujours dans ces circonstances. Pendant les chaleurs de l'été, dans les temps orageux, cette altération du suc pancréatique s'opère quelquefois en très-peu d'instant. Il faut alors bien avoir soin de maintenir au frais le suc pancréatique et l'animal qui le fournit, parce que l'altération du fluide aurait lieu dans la petite vessie de caoutchouc destinée à le recueillir, et fixée à l'extrémité du tube d'argent. Le dépôt qui se produit au moment de l'altération du fluide pancréatique m'a présenté quelquefois un aspect soyeux particulier j'ai toujours trouvé dans ces cas, au microscope, une grande quantité de cristaux en aiguille, offrant les caractères des cristaux de margarine ou d'acide margarique.

J'ai étudié le suc pancréatique sur les lapins, les chevaux et les oiseaux (poules et pigeons), et j'ai constaté que chez ces animaux, le suc pancréatique, obtenu dans de bonnes conditions, était, comme chez le chien, un liquide incolore plus ou moins filant, à réaction très-nettement alcaline, et se coagulant complètement par la chaleur.

Maintenant que nous connaissons toutes les variations que peut éprouver le suc pancréatique, il deviendra facile pour tout le monde de trouver la cause des dissidences des auteris sur la quantité de l'albumine contenue dans le suc pancréatique. Du reste, cette distinction du suc pancréatique en suc *normal* et suc *moribide* ou *altéré* n'est pas seulement une distinction (p. 72) utile pour étudier les propriétés physiques et chimiques de ce fluide, mais cette distinction est surtout indispensable pour se rendre compte de ses propriétés physiologiques ou digestives, ce qui, à notre point de vue, est la chose la plus importante.

§III — Propriétés physiologiques du suc pancréatique, son action spéciale sur les matières grasses neutres étudiée en dehors de l'animal

J'ai dit, au commencement de ce mémoire, que le suc pancréatique était destiné, à l'exclusion de tous les autres liquides

intestinaux, à modifier d'une manière spéciale, ou, autrement dit, à digérer les matières grasses neutres qui peuvent se rencontrer dans les aliments Rien n'est si facile à démontrer

1^{re} EXPÉRIENCE — Sur 2 grammes de suc pancréatique fraîchement extrait, alcalin et visqueux et possédant tous les caractères du fluide pancréatique *normal*, on ajouta dans un tube fermé par un bout 1 gramme d'huile d'olives L'huile, à cause de sa pesanteur spécifique, se tint à la surface, mais en agitant pour opérer le mélange des liquides, il en résulta aussitôt une émulsion parfaite, et tout se transforma en un liquide semblable à du lait ou mieux à du chyle

2^e EXPÉR — Sur 2 grammes de suc pancréatique frais et normal, on ajouta dans un tube fermé par un bout 1 gramme de beurre frais, on plaça le mélange au bain-marie à la température de 35 à 38° cent, peu à peu le beurre se fluidifia, et en agitant, il fut complètement émulsionné par le suc pancréatique, et il en résulta, comme dans l'expérience précédente, un liquide épais, onctueux, blanc comme du chyle

3^e EXPÉR — Avec 1 gramme de graisse de mouton (suif), on mélangea dans un tube fermé par un bout 2 grammes de suc pancréatique frais et normal, le tout fut exposé au bain-marie, à la température de 35 à 38° cent Bientôt la graisse de mouton se fluidifia, et agitée avec le suc pancréatique, elle fut transformée en un liquide blanc, semblable à du chyle

(p 73) 4^e EXPÉR — 1 gramme de graisse de pore (saindoux) fut mélangé avec 2 grammes de suc pancréatique frais et *normal* En agitant à froid, l'émulsion s'opérait déjà très-visiblement, mais en chauffant au bain-marie de 35 à 38°, l'émulsion fut instantanée, et tout fut transformé en un liquide blanc, crémeux, comme dans les cas précédents.

En laissant les produits des quatre expériences ci-dessus indiqués au bain-marie de 35 à 38° pendant quinze à dix-huit heures, l'émulsion dans tous les tubes se maintint parfaitement, le liquide blanchâtre et crémeux ne changea pas du tout d'apparence, et il n'y eut, par suite du repos du mélange, aucune séparation entre la matière grasse et le liquide pancréatique Mais au bout de quelques heures il devint évident que, sous l'influence du suc pancréatique, la graisse n'avait pas été simplement divisée et émulsionnée, mais qu'elle avait en outre été modifiée chimiquement En effet, au moment du mélange, la matière grasse neutre

et le suc pancréatique alcalin constituaient un liquide blanchâtre à réaction alcaline, tandis que, cinq ou six heures après, le mélange avait acquis une réaction très-nettement acide. En examinant ce qui s'était passé, il fut très-facile de constater, à l'aide de moyens ordinaires, que la matière grasse avait été dédoublée en glycérine et en acide gras. Dans le tube où du beurre avait été soumis à l'action du suc pancréatique, l'acide butyrique était reconnaissable à distance par son odeur caractéristique.

Des faits qui précèdent, il résulte donc que le suc pancréatique *normal* possède la propriété d'émulsionner instantanément et d'une manière complète les matières grasses neutres, et de les dédoubler ensuite en acide gras et en glycérine.

Le suc pancréatique seul jouit de cette propriété, avon-nous dit, et aucun autre liquide de l'intestin ou de l'économie n'exerce une semblable action sur les matières grasses neutres. Il est encore très-facile de donner la preuve de cette assertion.

(p 74) 1^{re} EXPÉRIENCE — *Bile*. On mélangea dans un tube fermé par un bout, avec 2 grammes de bile de chien fraîche et très-légèrement alcaline, 1 gramme d'huile d'olive. On agita fortement le mélange et on le plaça ensuite au bain-marie à la température de 35 à 38° cent. Au moment de l'agitation, l'huile se mélangea mécaniquement avec la bile de manière à former un liquide jaune et opaque, mais une demi-heure après, par suite de repos, l'huile s'était complètement séparée et revenue à la surface, tandis que la bile formait une couche parfaitement distincte dans la partie inférieure du tube. L'huile n'avait aucunement été modifiée. Avec la bile de bœuf et de lapin, les choses se passèrent de la même manière.

2^e EXPÉR — *Salive*. Avec 2 grammes de salive d'homme fraîche et alcaline, on mélangea 1 gramme d'huile d'olive. On agita fortement le mélange, et on le plaça au bain-marie à la température de 35 à 38° cent. Une division mécanique de l'huile eut également lieu, mais bientôt il y eut par le repos séparation complète de la salive et de l'huile, qui surnageait en conservant toutes ses propriétés physiques et chimiques. La salive du chien et celle du cheval furent également sans action sur l'huile d'olive.

3^e EXPÉR — *Suc gastrique*. 2 grammes de suc gastrique de chien, frais et très-nettement acide, furent additionnés de 1 gramme d'huile d'olive. L'agitation produisit un mélange momentané du suc gastrique

avec l'huile, qui bientôt remonta à la surface du liquide sans avoir été modifiée

4^e EXPÉR — *Sérum du sang* 1 gramme d'huile d'olive fut ajouté à 2 grammes de sérum du sang, provenant d'un chien saigné à jeun Le sérum était alcalin et limpide L'huile se mélangea par l'agitation avec le sérum, mais au bout de quelque temps de repos au bain-marie de 36 à 38° cent, la séparation de l'huile et du sérum s'était opérée d'une manière à peu près complète Le sérum du sang d'homme et celui de cheval se comportèrent de la même manière avec l'huile d'olive

5^e EXPÉR — *Liquide céphalo-rachidien* 1 gramme de liquide céphalo-rachidien de chien, limpide et alcalin, fut mélangé avec un demi-gramme d'huile d'olive Par l'agitation du liquide, il y eut division momentanée de l'huile Bientôt la séparation des deux (p 75) liquides fut effectuée, ce qui démontre que l'huile n'avait pas été modifiée par son contact avec le liquide céphalo-rachidien

Il est facile maintenant, en comparant l'action de la bile, de la salive, du suc gastrique, du sérum du sang, et du liquide céphalo-rachidien, à celle du suc pancréatique sur l'huile d'olive, de voir que, parmi tous ces liquides de l'économie, le suc pancréatique seul modifie, ainsi que nous l'avons avancé, la matière grasse neutre

Toutes les expériences qui précèdent ont été reproduites un très-grand nombre de fois,¹ et elles sont si nettes et si simples à répéter, que chacun pourra en vérifier les résultats avec facilité Mais c'est ici le lieu de rappeler la distinction essentielle que nous avons établie entre le suc pancréatique *normal* et le suc pancréatique *morbide* ou *altéré* En effet, cette émulsion instantanée des matières grasses neutres et leur dédoublement en glycérine et en acide gras n'est effectuée que par le suc pancréatique *normal*, c'est-à-dire le suc pancréatique alcalin, visqueux, et coagulant en masse par la chaleur et les acides Si, au contraire, on mélange par l'agitation avec de l'huile ou de la graisse du suc pancréatique *morbide* ou *altéré*, c'est-à-dire du suc pancréatique toujours alcalin mais, devenu aqueux, sans

¹ Parmi les savants qui jusqu'à présent ont été témoins de nos expériences sur le suc pancréatique, je pourrai citer MM Magendie, Rayet, Bouillaud, Andral, Bérard, et les membres de la Société de biologie Je reproduis en outre ces expériences dans tous mes cours de physiologie expérimentale

viscosité, et ne coagulant pas par la chaleur, son action sur les matières grasses est nulle, et bientôt il s'effectue une séparation entre le suc pancréatique inerte et la matière grasse non modifiée. On comprend très-bien que si l'altération du suc pancréatique est incomplète, et que si ce fluide coagule encore un peu par la chaleur, son (p. 76) action sur la graisse existera, mais d'une manière imparfaite. Cela permettra d'expliquer toutes les qualités intermédiaires possibles du suc pancréatique, depuis son état *normal* ou d'activité parfaite jusqu'à son état de complète *altération* ou d'entière inertie. Je ne reviendrai pas sur les causes qui amènent cette altération, je me suis expliqué à ce sujet au commencement du mémoire.

§IV—*Action du suc pancréatique dans la digestion étudiée sur l'animal vivant, son rôle indispensable pour l'absorption des matières grasses neutres et pour la formation du chyle*

D'après ce qui a été établi dans le paragraphe précédent, il est permis de penser que, pendant la digestion chez les animaux vivants et bien portants, le suc pancréatique se trouvant toujours à l'état *normal*, il sera facile de constater son action spéciale sur les matières grasses neutres alimentaires. Il résultera en effet des expériences qui vont suivre que le suc pancréatique, en émulsionnant et en modifiant les matières grasses dans l'intestin, les rend absorbables, et devient de cette manière l'agent unique et indispensable de la formation de ce liquide blanc homogène qui circule dans les vaisseaux lactés et auquel on donne le nom de chyle. Ce n'est point le moment de discuter la signification du mot *chyle*. Pour moi, le chyle et le chyme, avec les idées qu'on y attache encore aujourd'hui en physiologie, sont des dénominations complètement vides de sens. Seulement j'ai besoin de rappeler un fait qui est du reste parfaitement connu, c'est que les vaisseaux chylifères ou lactés ne contiennent un liquide blanc laiteux homogène qu'à la condition qu'ils aient absorbé des matières grasses dans l'intestin, de sorte que un chyle limpide et transparent (improprement qualifié par quelques auteurs par le mot de chyle végétal) est pour nous un chyle sans matière grasse, tandis qu'un chyle blanc, laiteux, homogène (qualifié,

par opposition au précédent, sous (p 77) le nom de chyle animal), est un chyle qui contient de la matière grasse émulsionnée et modifiée. Cela étant posé, il sera facile de prouver que c'est le suc pancréatique seul qui émulsionne, modifie dans l'intestin la matière grasse, et la rend absorbable par les chylifères.

Quand j'ai sacrifié des chiens en pleine digestion de matières grasses, j'ai constaté parfaitement que la graisse n'est que fluidifiée par la chaleur de l'estomac, qu'elle s'y reconnaît à ses caractères, et qu'elle se fige à la surface du suc gastrique par le refroidissement, comme de la graisse sur du bouillon. Dans l'intestin au contraire, au-dessous de l'ouverture des conduits pancréatiques, la graisse ne peut plus être distinguée par ses caractères, elle forme une matière pulvée, crémeuse, émulsive, colorée en jaunâtre par la bile. Les vaisseaux chylifères se voient alors gorgés d'un chyle blanc laiteux, homogène. En faisant sur des chiens la ligature des deux canaux pancréatiques, dont le plus petit s'ouvre très-près du canal cholédoque, tandis que le plus volumineux s'ouvre dans l'intestin à 2 centimètres plus bas, j'ai constaté que la graisse reste inaltérée dans l'intestin grêle, et que les vaisseaux chylifères ne contiennent plus qu'un chyle limpide, exempt de la matière grasse, qui n'a pas pu être absorbée à cause de la soustraction du suc pancréatique.

On pourrait se contenter de cette expérience comme preuve que la présence du suc pancréatique est indispensable à la formation du chyle. Mais j'ai trouvé une autre manière de prouver le même fait par une expérience très-élogieuse et irréfutable, parce qu'elle n'exige aucune mutilation préalable et qu'elle est très-facile à répéter par tout le monde. C'est chez le lapin, où la nature semble avoir été au-devant des désirs de l'expérimentateur en faisant ouvrir, par une bizarrerie singulière, le canal pancréatique, qui est unique, très-bas dans l'intestin, à 35 centimètres au-dessous du canal cholédoque. Or, il arrive que lorsqu'on fait manger de (p 78) la viande ou des matières grasses à des lapins, la graisse, passe inaltérée dans l'estomac et descend dans l'intestin sans subir aucune modification, jusqu'au moment où vient se déverser le suc pancréatique, à 35 centimètres au-dessous de l'ouverture du canal cholédoque, et on voit c'est

précisément après l'abouchement du canal du pancréas que les vaisseaux chylifères commencent à contenir un chyle blanc laiteux, tandis que plus haut ils ne contiennent qu'un chyle transparent. Il y a donc chez le lapin, dans ces conditions, les deux espèces de chyle le chyle transparent et sans graisse émanant des 37 centimètres d'intestin grêle situés avant l'abouchement du canal pancréatique, et le chyle laiteux homogène contenant de la graisse émanant des portions de l'intestin grêle placées au-dessous de l'abouchement du canal pancréatique. Je connais en physiologie peu d'exemples d'expérience aussi simple et aussi décisive que celle-là. Voici le procédé le plus rapide et le plus commode pour la répéter.

EXPÉRIENCE — On prendra préférablement un gros lapin adulte, et on le fera jeûner pendant vingt-quatre ou trente-six heures, puis on ingèrera dans son estomac, à l'aide d'une seringue et d'une sonde de gomme élastique, 15 ou 20 grammes de graisse de porc (saindoux), fluidifiée préalablement par une douce chaleur. Après cela, on donnera à manger au lapin de l'herbe ou des carottes, ce qui aidera à faire descendre la graisse dans l'intestin. On assommera le lapin au bout de trois ou quatre heures, on ouvrira aussi rapidement que possible le ventre, et on constatera avec grande facilité que la graisse n'est émulsionnée et modifiée que 35 centimètres après l'ouverture du canal cholédoque, au point où le suc pancréatique s'est déversé dans le duodénum, et que ce n'est qu'après cela que les vaisseaux chylifères blancs laiteux commencent à se montrer pour continuer à exister ensuite plus ou moins bas dans l'intestin grêle.

Mais, dira-t-on, puisqu'il est si simple et si facile de démontrer que c'est le suc pancréatique et non la bile qui émulsionne la graisse pour la rendre absorbable par les vaisseaux (p. 79) chylifères, comment se fait-il que la chose soit restée ignorée si longtemps, et que Brodie¹ ait soutenu par des expériences que ce rôle appartenait à la bile? Je crois, en effet, être le premier qui ait démontré cette action du fluide pancréatique sur les matières grasses et je pense avoir donné à l'appui des preuves expérimentales suffisantes. Si les physiologistes qui ont ex-

¹ *Quarterly journal of science*, janvier 1825

périmenté directement sur le fluide pancréatique n'ont pas reconnu cette propriété, c'est qu'ils ne l'ont pas cherchée, peut-être parce qu'ils étaient imbus de cette idée fausse que le suc pancréatique est analogue à la salive. Du reste, si aujourd'hui, comme je l'espère, la chose reste claire et acquise à la science, je dois avouer qu'il m'a fallu longtemps rechercher et travailler, et sacrifier bien animaux, avant de parvenir à établir les faits tels que je les donne dans ce mémoire.

Relativement aux expériences de Brodie, il faut les rapprocher de celles de M. Magendie,¹ avec lesquelles elles furent en contradiction. Voici, en effet, ce qui arriva. M. Magendie rendit compte, dans son *Journal de physiologie*, des expériences de Brodie, desquelles il résultait que ce physiologiste, après avoir lié le canal cholédoque sur des chats, avait observé que les vaisseaux chylifères ne contenaient plus de graisse, et que le chyle était limpide et transparent. M. Magendie, dans l'intention de vérifier les mêmes expériences, fit la ligature du canal cholédoque sur des chiens, et il observa, contrairement à Brodie, que, malgré l'absence de la bile dans l'intestin, la graisse avait été émulsionnée, et que les chylifères contenaient un chyle blanc laiteux homogène. Ces expériences peuvent s'expliquer ainsi qu'il suit. Chez le chat, le canal (p. 80) pancréatique principal² s'anastomose avec le canal cholédoque avant de s'ouvrir dans l'intestin, de sorte qu'il est supposable que Brodie, n'ayant en vue que l'action de la bile, et n'attachant pas d'importance au canal pancréatique, l'aura lié avec le canal cholédoque, et de cette façon, on s'explique très-bien comment la graisse n'a pas pu être émulsionnée, et comment le chyle était limpide et ne contenait pas de matière grasse. M. Magendie fit ses expériences sur des chiens, où le canal cholédoque est complètement isolé des deux conduits pancréatiques. Il en résulte clairement que l'écoulement, du suc pancréatique étant resté libre, la graisse put continuer à être émulsionnée, et le chyle rester blanc laiteux homogène. Ces expériences sont donc exactes de part et d'autre, la

¹ *Journal de physiologie expérimentale*, 1823, t. III, p. 93.

² Il y a bien chez le chat un autre petit conduit pancréatique, mais il est rudimentaire et m'a paru imperméable.

différence des résultats s'expliquerait par la disposition particulière des insertions des conduits pancréatiques sur les espèces d'animaux qui ont servi à ces expériences. De sorte que ces faits ne se contredisent réellement pas, et ils viennent à l'appui de ce que j'ai établi, à savoir que c'est le suc pancréatique et non la bile qui agit sur la graisse et la rend absorbable.

Conclusion. Actuellement je pense avoir atteint le but que je m'étais proposé au commencement de ce mémoire, c'est-à-dire que je crois être parvenu à démontrer expérimentalement que le fluide pancréatique est destiné, à l'exclusion de tous les autres liquides intestinaux, à modifier d'une manière spéciale, ou autrement dit, à digérer les matières grasses neutres contenues dans les aliments, et à permettre de cette manière la formation du chyle ou leur absorption ultérieure par les vaisseaux chylifères.

Je viens d'examiner la fonction du suc pancréatique, indépendamment de celle de la bile. Dans un autre travail, je montrerai qu'en s'unissant, ces deux fluides ont encore un (p. 81) autre rôle à remplir dans la digestion, et à ce propos, j'étudierai avec soin les propriétés de la matière active du suc pancréatique, que je suis parvenu à isoler et à caractériser.

En terminant, je dois ajouter encore que les expériences contenues dans ce mémoire n'infirment nullement les observations de MM. Bouchardat et Sandras,¹ qui apprennent que l'amidon est transformé en glucose par le suc pancréatique. Seulement je ferai remarquer que cette action du fluide pancréatique sur l'amidon ne lui est pas spéciale, c'est une propriété générale qui appartient à la salive mixte, au sérum du sang, à une foule d'autres liquides alcalins de l'économie,² et aussi bien au suc pancréatique morbide ou altéré qu'à celui qui est normal. La modification des matières grasses neutres constitue au contraire le rôle essentiel et spécial du suc pancréatique dans la digestion, puisqu'il ne partage cette propriété avec aucun autre fluide de l'économie, et qu'il la perd aussitôt que sa matière coagulable active se trouve altérée.

¹ Comptes rendus de l'Institut

² Voir mon mémoire sur le rôle de la salive dans la digestion, dans les *Archives générale de médecine*, janvier 1847



Pancreatic Juice and its Rôle in the Phenomena of Digestion

BY

CLAUDE BERNARD

Professor of Anatomy and Experimental Physiology, etc

(Work read at the Society of Biology)

Archives Générales de Médecine, 4 S, 19 60-81, 1849



FOR a long time, anatomists have considered the pancreas as an abdominal salivary gland. Doubtless guided by the same induction and also by insufficient experiments, some physiologists have given the pancreatic juice the attributes of saliva. This comparison between the pancreas and the salivary glands is false, and it is indeed far from expressing the uses of the pancreatic juice in digestion such as I will establish.

I propose as purpose for this work, to demonstrate experimentally that the pancreatic fluid is intended, to the exclusion of all other intestinal fluids, to modify in a special manner, or, said in another way, to digest the neutral fat material contained in the food, and to permit (p 61) in this manner their later absorption by the chyliferous vessels ¹

I will not tell here how and by what series of facts I was led to discover this remarkable and unforeseen rôle of the pancreatic gland. I will say only it was after a long and attentive study of

¹ The first results of my researches on the pancreas were given to the journal "l'Institut," at the beginning of the year 1848

living nature that I succeeded in clearly determining the experimental conditions of the physiological phenomena which I will describe. I will indicate first with care, although briefly, the variable conditions of the experimentation which may modify the properties of the pancreatic juice, so that the results which I will give may readily be reproduced by anyone who wishes to repeat my experiments.

I Concerning the extraction of pancreatic juice and the conditions of its secretion

First experiment At the beginning of digestion. A very large hunting-dog, spaniel, fasting for 12 hours and in good health, made, at 7 A.M., a fairly large meal on meat, and then she drank water. Almost immediately after the ingestion of the food was completed, the animal was placed on a table in order to extract its pancreatic juice. I followed for this purpose the ordinary experimental procedure, that is, I made an incision in the right hypochondrium, below the edge of the ribs, which permitted of exteriorizing the duodenum and a part of the pancreas. The tissue of the pancreas was of a light rosy coloring, and its vessels were moderately distended with blood. The duodenum was empty of food and no white chyliferous vessel was visible. I isolated as rapidly as possible the more voluminous of the two pancreatic ducts, which, in the dog, open singly and obliquely into the duodenum at about 2 centimeters below the choledochus duct. This duct, of a pearly white and the size of a strong quill of a raven, was swollen by (p. 62) liquid. At every effort which the animal made in crying, the quantity of liquid flowed more considerably and the duct became more distended. I then opened the pancreatic duct with the point of fine scissors, and immediately there flowed out by large beady drops the pancreatic juice, colorless, clear, showing a viscous and ropy consistency. In opening the pancreatic duct near its insertion on the duodenum, a little blood also flowed as a result of the injury of the small neighboring vessels. But the surprising thing was that the pancreatic juice did not mix with the blood, and remained separated in the manner of an oily liquid or of a very gummy solution.

I then introduced into the open pancreatic duct a small silver tube, 3 mm in diameter and 5 cm in length, which I fixed by means of a thread previously passed under the duct. Then having returned the duodenum and pancreas within the abdomen, I closed the wound by a

suture, taking care to keep the free end of the silver tube outside, so that I could collect the pancreatic fluid. Indeed, almost immediately pancreatic liquid flowed from the tube in the form of great ropy drops, limpid, coming more rapidly when the animal made an effort, and having a very alkaline reaction on litmus paper.

After having established the alkaline reaction of the first drops of the pancreatic juice, I attached a small bladder to the tube to collect it, this little bladder had previously been compressed so as to expel the air and cause aspiration on the liquid by the tendency of the rubber walls to resume their rounded form. The animal, having been untied and set free, went to lie down in a corner of the laboratory, where it remained quiet without any unfavorable phenomena.

The little bladder was placed on the tube at 7 30 A M, I returned to the laboratory at 1 P M, ($5\frac{1}{2}$ hours later). I found the dog calm and still lying down. I detached the little bladder, distended by the liquid, and found that it contained 8 7 grams of pancreatic juice, limpid, colorless, oily, ropy, and turning red litmus paper markedly blue. Liquid with the same characters continued to flow drop by drop from the tube, on which I replaced the little rubber bladder. At 5 P M, I removed the little bladder once more, (p. 63) containing exactly 8 gms. of pancreatic juice, quite alkaline and with the characters previously indicated.

The next morning, the second day of the operation, the pancreatic juice flowed in abundance, and the drops succeeded each other rapidly. I obtained in the same manner, in the space of $1\frac{1}{4}$ hours, 16 gms. of pancreatic juice which was evidently modified. This liquid, still markedly alkaline, was fluid as water, and had lost all the viscosity it had the evening before, furthermore, it was slightly opalescent and deposited a small tomentous cloud at the bottom of the glass. During the afternoon, the silver tube and the ligature dropped out. The animal ate nothing and would only drink abundantly, it had fever, and the wound was very inflamed.

The third day of the operation, the dog drank some milk. The abdominal wound entered into suppuration, and at the end of 8 or 9 hours it was entirely cicatrized and the dog was perfectly recovered.

The experiment which I have just recounted furnishes an example of the greatest possible success. Indeed, the operation was rapid, the pancreas was not exteriorized except for a small portion of its extent, and it did not remain exposed to the air more than 5 or 6 minutes, the time necessary to find the pan-

creatic duct, isolate it, open it, and fix the silver tube The tissue of the pancreas was only slightly turgid, the animal was at the beginning of digestion, and it is in this condition that I have always been able to obtain the most considerable quantities of pancreatic juice, which makes an average of almost 2 gms an hour The next day, after development of inflammatory symptoms in the wound, I obtained 16 gms of the same fluid in $1\frac{1}{4}$ hours The quantity of the secretion was thus considerably increased, but the pancreatic juice then offered a very great fluidity and was profoundly modified in its physiologic properties, as will be shown later

(p 64) *Second experiment In the midst of digestion* With a large, very lively dog, which had eaten a meal of meat 4 hours before, and was in the midst of digestion, I exteriorized the pancreas in the same manner as in the preceding experiment, after which I isolated the duct, on which a silver tube 3 mm in diameter was fixed The pancreas was gorged with blood, its vessels were turgid, and its tissue presented an intense red coloration The duodenum contained food, and at its surface were numerous chyliferous vessels, full of white, homogenous chyle The parts were replaced within the abdomen, and about 2 minutes after the apposition of the tube on the pancreatic duct, there flowed from it a limpid drop of pancreatic juice, of a viscous and adhesive aspect, giving a very marked alkaline reaction on litmus paper In this manner, 2 or 3 drops of pancreatic fluid per minute flowed I placed the little rubber bladder in position at 11 A M, and returned to the laboratory 6 hours later I then removed from the bladder 5 gms of pancreatic juice, limpid, viscous, of glutinous aspect, and turning red litmus paper markedly blue The next day, (2nd day of operation), I was able to collect about 25 gms of pancreatic juice But this juice of the next day, more abundant than on the day before, had become very fluid, devoid of viscosity, slightly opaline, and always having a very marked alkaline reaction on litmus paper The wound in the abdomen was sensitive and inflamed The following days the symptoms disappeared, the wound cicatrized and the dog recovered promptly

The second experiment was made rapidly and under good conditions It did not differ from the first except that the animal was in full digestion, instead of being at the beginning If we

sum up the results obtained, we see 1) that in this experiment during digestion, the pancreas was turgid, distended with blood and as if erectile, 2) that the quantity of pancreatic juice provided was less abundant, 3) that the next day, after the development of inflammation in the wound, the pancreatic secretion was augmented, and that the juice became more aqueous and was evidently modified

(p 65) *Third experiment During abstinence* With a healthy dog of medium size, fasting for 24 hours, I exteriorized a part of the pancreas through a small incision in the right hypochondrium The first thing which attracted my attention was the extreme pallor of the pancreas, this organ was as if exsanguine, its vessels developed very little, and the color of its tissue approaching the whiteness of milk The pancreatic duct was empty and flattened I incised it, nothing flowed out, I placed a small silver tube as usual, after which I returned the herniated portion of the pancreas within the abdomen, closing the wound with a suture I watched for 10 minutes, and nothing flowed from the end of the tube After this time, I attached the little rubber bladder Three hours later, I removed it, it was empty, and its walls were barely moistened by traces of pancreatic juice Meanwhile, a drop of the liquid having formed at the end of the tube, I was able to confirm clearly the glutinous and ropy aspect and the alkaline reaction of the pancreatic juice During the rest of the day, there flowed only a few very rare drops of the pancreatic juice, with the characters just mentioned The next afternoon (about 30 hours after the operation), the pancreatic secretion became excessively abundant, and there flowed from the silver tube drops of a colorless fluid, devoid of viscosity, liquid as water, and having a very frankly alkaline reaction on litmus paper I collected about 18 gms of this pancreatic juice in an hour The edges of the wound were tumefied and inflamed The next day the silver tube fell out with its ligature, and a few days later, the dog was completely recovered

This experiment, which also was made rapidly and under good conditions, shows that during abstinence the tissue of the pancreas is white, exsanguine, at the same time as the duct is empty and flattened The quantity of pancreatic juice which may be collected at this time is excessively small and insufficient for experiments The next day, when the inflammation of the

wound was manifested, the pancreatic secretion became very active, but this juice did not have the normal characters and was altered

Therefore, in experiments made under experimental conditions (p 66) which are as good as possible, it may occur that variable quantities of pancreatic juice are obtained, depending on whether the animal is in abstinence or a different period of digestive function. But a poorly performed experiment may also for its part modify the pancreatic secretion

Fourth and fifth experiments Irregularly performed 1 With a dog of medium size, vigorous and unmanageable, being in digestion, I applied the silver tube to the pancreatic duct in the ordinary way, but there was, at the moment of the issue of the pancreas through the wound, a considerable hernia of the other abdominal viscera. The reduction of these was very long and very difficult, because of the constant efforts which the animal made in struggling. It resulted that the pancreas and a part of the intestines remained for quite a time exposed to the air, and that the organs were more or less malaxated before I succeeded in reducing them into the abdomen. After this laborious operation, the dog appeared ill at ease, and was taken with vomiting. Nothing flowed from the silver tube, and the pancreatic secretion was completely suspended for four or five hours. After this time, 2 or 3 gms of alkaline fluid, but without viscosity and slightly cloudy, could be obtained: it was the altered pancreatic juice. The following days, the dog was affected by a violent peritonitis, of which, however, he did not die.

2 With another dog, also in digestion, the incision in the right hypochondrium having been made too small, the pancreas and the portion of the duodenum exteriorized were compressed and strangulated by the circumference of the wound. Because of the obstacle to the return of the venous blood, these organs rapidly became turgid and violet-colored, and the search for the pancreatic duct was rendered longer and more difficult by this. That which is of particular interest in this experiment is that, on opening the pancreatic duct, there flowed out 2 or 3 drops of juice which was reddish, instead of being colorless and limpid as usual. After having reduced the organs and stitched the wound, there flowed from the silver tube, in about 4 hours, 1 gm of pancreatic juice, slightly viscous, alkaline, but always showing an abnormal reddish coloring. The pancreatic fluid which was collected

later (p 67) became colorless and presented almost its normal characters, always its viscosity was less. All the rest of the experiment passed off as usual, and the dog recovered.

During the last two years, in order to repeat the experiments in my courses, or to show savants who wished to see them, I have extracted pancreatic juice from 34 dogs. Still, I have limited myself to the report of the seven preceding experiments, because they sum up almost all the circumstances of experimentation which it is necessary to know. Therefore, from these experiments it develops that when one wishes to obtain the largest possible quantity of pancreatic juice, it is necessary to take a dog at the beginning of its digestion. Furthermore, it is necessary to perform the experiment with celerity and leave the pancreas exposed to the air the shortest possible time. Under these conditions, the secretion of the pancreatic juice is not suspended by the operation, and the quantity which may be obtained before the development of morbid conditions has never exceeded 2 gms per hour for a large dog. This quantity becomes much less if the experiment is made slowly or under poor conditions. But another very important circumstance which has not been indicated is that the pancreatic secretion increases considerably at the moment when the consequent inflammation of the pancreas appears. Sometimes this phenomenon manifests itself shortly after the operation, or it may not appear until the next day, or even the day after. But this altered secretion is, as we have seen, devoid of the physiologic properties of the normal pancreatic juice.

It was therefore quite important to avoid these difficulties and causes of uncertainty in the extraction of pancreatic juice. I thought of establishing pancreatic fistulas for that purpose, but I encountered unbelievable difficulties in reaching that end. The divided pancreatic duct reestablished itself in a few days, so that, in order to maintain the flow (p 68) of the liquid outside, it was necessary to make use of a very special apparatus. I was able to obtain fairly easily the permanent evacuation of the pancreatic fluid to the outside, however, although the animals con-

tinued to eat, they did not resist the incessant loss of the pancreatic liquid, and they died at the end of ten or twelve days in marasmus and the most astonishing emaciation. In a word, it was necessary to construct an apparatus combined in such a way that one could at will withdraw the pancreatic juice and give it back to the animal except at the time of experimentation. I finally succeeded after two years of patience, but since this apparatus is equally applicable to the choledochus duct, I will give the description later, when I take up the rôle of the bile and the pancreatic juice combined in the phenomena of digestion.

II Physical and chemical characters of pancreatic juice

In accordance with that which has been established in the preceding, we may distinguish two kinds of pancreatic juice: 1) the *normal* pancreatic juice, obtained under good conditions, before inflammation has taken possession of the pancreas, or collected from a dog with a pancreatic fistula, 2) the *morbid* pancreatic juice, which is habitually secreted in great abundance at the time when the symptoms of inflammatory reaction appear in the pancreas and in the wound in the abdomen.

The *normal* pancreatic juice is a colorless, limpid, viscous and glutinous liquid, flowing slowly by large beady or syrupy drops, and becoming frothy on agitation. This fluid is without characteristic odor, placed on the tongue, it gives the tactile sensation of a viscous liquid, its taste has something salty which is very analogous to the flavor of blood serum. I constantly found (p. 69) the reaction of pancreatic juice very manifestly alkaline, never, in any case, did I find it neutral or acid.—The normal pancreatic juice, when exposed to heat, coagulates *en masse* and is converted into a concrete material of great whiteness. The coagulation is entire and complete, as if it were the white of egg: all becomes solid, and not a single drop of liquid remains free. This white material of pancreatic juice is also precipitated by nitric and sulphuric acids, and by concentrated hydrochloric acid. The metallic salts, wood spirit, and alcohol also precipitate in a complete manner the organic material of pancreatic juice. Diluted acetic, lactic and hydrochloric acids do not coagulate the

pancreatic juice The alkalis do not produce any precipitate, and they redissolve the organic material when it has been previously coagulated by heat, acids or alcohol

In summing up the characters of the pancreatic juice, it would seem that one has the right to conclude, as has already been done by Magendie, Tiedemann and Gmelin, etc., that the pancreatic juice behaves like the albuminous liquids. Indeed, a soluble material which is coagulated by heat and the energetic acids possesses the characters of albumin. However, there is no relation from the physiologic point of view, in my opinion, between the pancreatic juice and an albuminous liquid. Thus, as I will prove that it is the coagulable principle which is the active principle, I am forced to conclude that the material of the pancreatic juice is not physiologically an albumin, although it has the chemical characters of one. I state, meanwhile, that this identity is not complete, because I have found characters which distinguish chemically between pancreatic material and albumin, I limit myself to citing the following. When the material of the pancreatic juice has been coagulated (p. 70) by alcohol and then dried, it redissolves totally and readily in water,¹ while albumin, treated in the same manner, does not redissolve in water in an appreciable manner.

The *morbid* pancreatic juice is a liquid of aqueous consistency, devoid of viscosity, habitually colorless, but often opalescent, and sometimes of reddish color. This fluid has a salty flavor and is nauseous at the same time, its reaction is always alkaline, its density is less great. Treated with heat and the acids, it no longer coagulates.—The transformation of *normal* pancreatic juice into *morbid* does not occur abruptly, but on the contrary, in a gradual manner, so that between the characters assigned to normal and morbid pancreatic juice, one may find many intermediaries. However, these variations affect only the presence of the active coagulable material, which is very abundant in the first pancreatic juice withdrawn after a well-performed operation,

¹ And gives to the water the particular viscosity of pancreatic juice and its physiologic properties such that it is indeed the active material of pancreatic juice

while the proportion of the same material diminishes progressively as that moment becomes distant, and may be completely lacking when the inflammation has frankly set in in the pancreatic tissue. In proportion as this material disappears, the pancreatic juice becomes more and more aqueous and loses its activity. All that may be summed up in saying that the pancreatic juice is more normal and more active when it coagulates more with heat, and it is more inert and more altered when it coagulates less.

The pancreatic juice is without contradiction the most unstable of the liquids of the economy. When normal pancreatic juice is exposed (p. 71) to a low temperature (5° to 10° above 0), it may be preserved several days, and it is noticed that by lowering of temperature, the viscosity of the liquid increases, and it becomes of the consistency of a light jelly. It, on the other hand, the pancreatic juice is kept at a temperature of 40° or 45° , it changes rapidly, and at the end of several hours, it is completely altered, that is to say, it gives off a nauseous odor, it shows a cloudy deposit, and loses the property of being coagulated by heat. The alkaline reaction of the liquid persists always under these circumstances. During the heat of summer, during stormy weather, this alteration occurs sometimes in very few moments; therefore care should be taken to keep the pancreatic fluid and the animal which furnishes it cool, because the alteration of the fluid could take place in the little rubber bladder for collecting it, attached to the end of the silver tube. The deposit which is produced at the moment of alteration of the pancreatic fluid several times showed a particular silky aspect: in these cases, I always found, in the microscope, a large quantity of crystals in the form of needles, showing the characters of crystals of margaric acid or of margaric acid.

I have studied the pancreatic juice of rabbits, horses and birds (hens and pigeons), and I have confirmed that in animals, the pancreatic juice, obtained under good conditions, was, as in the dog, a colorless, more or less ropy liquid, with very clearly alkaline reaction, and being completely coagulated by heat.

Now that we know all the variations which the pancreatic juice may undergo, it will be very easy for everyone to find the cause

of the dissidence of writers on the quantity of albumin contained in the pancreatic juice. Moreover, this distinction of pancreatic juice into *normal* juice and *morbid* or *altered* juice is not only a distinction which is useful (p 72) in studying the physical and chemical properties of this fluid, but this distinction is especially indispensable to account for its physiologic or digestive properties, which, from our point of view, is the most important thing

III Physiologic properties of pancreatic juice, its special action on neutral fatty materials studied outside the animal

I stated at the beginning of this memorandum, that the pancreatic juice was intended to the exclusion of all other intestinal liquids, to modify in a special manner, or said otherwise, to digest the neutral fatty materials which it might encounter in the food. Nothing is simpler to demonstrate

First experiment To 2 gms of freshly extracted pancreatic juice, alkaline and viscous and possessing all the characters of *normal* pancreatic fluid, there is added in a tube which is closed at one end, 1 gm of olive oil. The oil, because of its specific gravity, lies on the surface, but by shaking to cause the mixture of the liquids, there immediately results a perfect emulsion, and the whole transforms itself into a liquid similar to milk, or better, to chyle.

Second experiment To 2 gms of fresh and normal pancreatic juice, there is added in a tube closed at one end, 1 gm of fresh butter, the mixture is placed in a water-bath at a temperature of 35° to 38°, and slowly the butter becomes fluid, and on agitating, it is completely emulsified by the pancreatic juice and there results, as in the preceding experiment, a thick, unctuous liquid, white as chyle.

Third experiment With 1 gm of mutton fat (tallow), there is mixed in a test tube 2 gms of fresh and normal pancreatic juice, the whole is then put in the water-bath at a temperature of 35° to 38°C. The mutton fat soon becomes fluid, and agitated with the pancreatic juice, it is transformed into a white liquid, similar to chyle.

(p 73) *Fourth experiment* One gm of pork fat (lard) was mixed with 2 gms of fresh, *normal* pancreatic juice. On agitating it while cold, the emulsion operated quite visibly, but on heating it in the water-bath to 35° to 38°, the emulsion was instantaneous, and it all was transformed into a white, creamy liquid, as in the preceding cases.

On leaving the products of the four experiments above in the water-bath at 35° to 38° for 15 to 18 hours, the emulsion in all the tubes was perfectly maintained, the whitish and creamy liquid did not change in appearance at all, and there was not, as a result of the quietude of the mixture, any separation between the fatty material and the pancreatic liquid. But at the end of several hours, it became evident that under the influence of the pancreatic juice, the fat was not simply divided and emulsified, but it furthermore had been modified chemically. Indeed, at the moment of mixture, the neutral fat material and the alkaline pancreatic juice constituted a whitish liquid with alkaline reaction, while, 5 or 6 hours later, the mixture had acquired a clearly acid reaction. In examining what had occurred, it was very easy to establish, by ordinary means, that the fatty material had been decomposed into glycerine and a fatty acid. In the tube in which butter had been subjected to the action of the pancreatic juice, butyric acid was recognizable at a distance by its characteristic odor.

From the preceding facts it results that *normal* pancreatic juice possesses the property of instantly emulsifying fatty materials in complete fashion, and of then decomposing them into a fatty acid and glycerine.

Pancreatic juice alone enjoys this property, as has been said, and no other liquid of the intestine or of the economy exercises a similar action on neutral fat materials. It is quite easy to give proof of this assertion.

(p. 74) *First experiment Bile* In a test tube, 2 gms of fresh and slightly alkaline bile of a dog was mixed with 1 gm of olive oil. The mixture was shaken vigorously and then placed in the water-bath at a temperature of 35° to 38° . At the moment of agitation, the oil mixed mechanically with the bile so as to form a yellow, opaque liquid, but half an hour later, as a result of rest, the oil had completely separated and come to the surface, while the bile formed a perfectly distinct bed in the lower part of the tube. The oil was not at all modified. The same thing happened with the bile of ox and rabbit.

Second experiment Saliva With 2 gms of fresh and alkaline saliva of man, there was mixed 1 gm of olive oil. The mixture was

vigorously shaken, and placed in the water-bath at a temperature of 35° to 38°C . A mechanical division of the oil also took place, but soon, by rest, there was complete separation of the oil and saliva, and the oil floated on top, conserving all its physical and chemical properties. The saliva of the dog and that of the horse were equally without action on olive oil.

Third experiment Gastric juice Two gms of gastric juice of the dog, fresh and clearly acid, were added to 1 gm of olive oil. Agitation produced a momentary mixture of the gastric juice with the oil, which very soon came to the surface of the liquid without being modified.

Fourth experiment Blood serum One gm of olive oil was added to 2 gms of blood serum, obtained from a dog which was bled while fasting. The serum was alkaline and limpid. The oil mixed by agitation with the serum, but after a period of rest in the water-bath at 36° to 38°C , the separation of the oil and serum had taken place in an almost complete manner. The serum from the blood of man and horse behaved in the same manner with olive oil.

Fifth experiment Cephalorrhachidian fluid One gram of cephalorrhachidian fluid of the dog, limpid and alkaline, was mixed with $\frac{1}{2}$ gm of olive oil. By agitation of the liquid, there was a momentary division of the oil. Soon the separation of the two (p. 75) liquids was effected, which showed that the oil had not been modified by its contact with the cephalorrhachidian fluid.

It is easy, therefore, in comparing the action of bile, of saliva, of gastric juice, of blood serum, of cephalorrhachidian fluid, with that of pancreatic juice on olive oil, to see that, among all the liquids of the economy, only pancreatic juice modifies, as we have seen, neutral fatty materials.

All the preceding experiments have been reproduced a very large number of times,¹ and they are so clear and so simple to repeat, that everyone may verify the results with facility. But this is the place to recall the essential distinction which we have established between the *normal* pancreatic juice and the *morbid* or *altered* pancreatic juice. Indeed, this instantaneous emulsion

¹ Among the scholars who, up to the present, have witnessed our experiments on the pancreatic juice, I can name MM. Magendie, Royer, Bouilloud, Andrall, Berard and the members of the Society of Biology. I have reproduced, in addition, these experiments in all my courses in experimental physiology.

of neutral fatty materials and their decomposition into glycerine and a fatty acid is not accomplished except by *normal* pancreatic juice, that is, the alkaline, viscous pancreatic juice which coagulates as a whole with heat and acids. If on the contrary, one mixes by agitation some oil or fat with *morbid* or altered pancreatic juice, that is, the still alkaline pancreatic juice which has become aqueous, without viscosity, not coagulating with heat, its action on fatty materials is nil, and soon there is a separation between the inert pancreatic juice and the unmodified fatty material. It is readily understood that if the alteration of the pancreatic juice is incomplete, and the fluid still coagulates somewhat with heat, its (p 76) action on fat exists, but in an imperfect manner. This permits of explaining all the intermediary qualities possible to pancreatic juice, from its normal state, of perfect activity, to its state of complete alteration, or of entire inertia. I shall go back to the causes which lead to this alteration, as I explained the matter at the beginning of this memorandum.

IV. Action of pancreatic juice in digestion, studied in the living animal, its indispensable rôle in the absorption of neutral fats and the formation of chyle

After what has been established in the preceding paragraph, it is permissible to think that, during the digestion of living and healthy animals, the pancreatic juice being always in the *normal* state, it would be easy to confirm its special action on neutral alimentary fats. In fact, it develops from the experiments which will follow that the pancreatic juice, by emulsifying and modifying the fatty materials in the intestine, renders them absorbable, and becomes in this manner the sole and indispensable agent for the formation of that white homogeneous liquid which circulates in the lacteal vessels, to which the name of chyle has been given. This is not the time to discuss the significance of the word *chyle*. In my opinion, chyle and chyme, with the ideas which are attached to them today, are names which are completely void of sense. It is only necessary to recall a fact which is well-known, that the chyliferic or lacteal vessels do not contain a white milky homogeneous liquid except under the condition that they have

absorbed fatty materials from the intestine, so that a limpid and transparent chyle (improperly qualified by some writers by the word vegetable chyle) is for us a chyle without fat, while a white, milky, homogeneous chyle (qualified, in opposition to the preceding, with (p 77) the name animal chyle) is a chyle which contains emulsified and modified fat. That being granted, it will be easy to prove that it is the pancreatic juice alone which emulsifies, modifies the fatty material in the intestine, and renders it absorbable by the chyliferics.

When I sacrificed dogs in the midst of digestion of fatty materials, I established perfectly that the fat was only fluidified by the heat of the stomach, that it was recognizable by its characters, that it coagulated on the surface of the gastric juice on chilling, as the fat on soup. In the intestine, on the contrary, below the opening of the pancreatic ducts, the fat could no longer be distinguished by its characters, it formed a pap-like, creamy emulsive material, colored yellowish by the bile. The chyliferic vessels were then seen gorged with a white, milky, homogeneous chyle. In ligating the two pancreatic ducts in dogs, the smaller of which opens very near the choledochus duct, while the larger opens into the intestine 2 cm lower, I found that the fat remained unaltered in the small intestine, and that the chyliferic vessels contained only a limpid chyle, free of fatty material, which could not be absorbed because of the removal of the pancreatic juice.

One could be satisfied with this experiment as proof that the presence of pancreatic juice is indispensable to the formation of chyle. But I have found another way of proving the same fact by a very correct and irreproachable experiment, because it requires no preliminary mutilation and is very easily repeated by anyone. In the rabbit, where Nature seems to have anticipated the desires of the experimenter, the pancreatic duct, which is single, opens, by an oddity, 35 cms below the choledochus duct. Thus, it happens that when one feeds (p 78) meat or fatty materials to rabbits, the fat passes unaltered through the stomach and descends the intestine without any modification until the moment when the pancreatic juice is poured in, at 35 cms below

the opening of the choledochus duct, and one sees that it is precisely after the opening of the pancreatic duct that the chyliferic vessels begin to contain a white, milky chyle, while higher they contain only a transparent chyle. Therefore, there are, in the rabbit, under these conditions, two kinds of chyle: the transparent chyle without fat which emanates from the 37 cms. of small intestine above the opening of the pancreatic duct, and the homogeneous milky chyle containing fat, emanating from the portions of the small intestine situated below the opening of the pancreatic duct. I know of few examples in physiology of experiment as simple and as decisive as that. Here is the most rapid and the easiest procedure for repeating it.

Experiment. One will take by preference a large adult rabbit, and let him fast for 24 or 36 hours, then ingest in the stomach, with the aid of a syringe and elastic rubber sound, 15 to 20 gms. of pork fat (lard), previously liquefied by gentle heat. After that, feed the rabbit grass and carrots, which will aid the fat to descend into the intestine. Kill the rabbit at the end of 3 or 4 hours, open the abdomen as quickly as possible, and one will confirm with great ease that the fat is not emulsified and modified until 35 cms. after the bile duct, at the point where the pancreatic duct pours into the duodenum, and that it is not until after that, that the milky white chyliferic vessels begin to show themselves, and continue to exist more or less farther down the small intestine.

But, one will ask, since it is so simple and easy to demonstrate that it is the pancreatic juice and not the bile which emulsifies fat to render it absorbable by the (p. 79) chyliferic vessels, how does it happen that the fact has remained unknown so long, and that Brodie¹ sustained by experiments that this rôle belongs to the bile? I believe, in fact, that he is the first who has demonstrated this action of the pancreatic fluid on fatty materials, and that he has sufficient experimental proofs in support of it. If the physiologists who have experimented directly with pancreatic fluid have not recognized that property, it is because they have not looked for it, perhaps because they were imbued with the false idea that pancreatic juice is analogous to saliva. Moreover,

¹Quoted in Journal of Science, January 1823

if today, as I hope, the matter is clear and ascertained by science, I must say that it required long research and work, and the sacrifice of many animals, to succeed in establishing the facts as I have given them in this memorandum

Relative to the experiments of Brodie, they must be compared with those of Magendie,¹ with which they were in contradiction Here, in fact, is what happened Magendie reported, in his *Journal de physiologie*, the experiments of Brodie, from which it resulted that this physiologist, after having ligated the choledochus duct in cats, observed that the chyliferic vessels no longer contained fat, and that the chyle was limpid and transparent Magendie, with the intention of verifying the same experiments, made the ligation of the choledochus duct on dogs, and he observed, contrary to Brodie, that in spite of the absence of bile in the intestine, the fat had been emulsified and the chyliferics contained a homogeneous milky white chyle These experiments may be explained by the following In the cat, (p 80) the principal pancreatic duct² anastomoses with the choledochus duct before opening into the intestine, so that it is possible to suppose that Brodie, having in mind only the action of the bile, and not attaching importance to the pancreatic duct, ligated it with the choledochus duct, and in this fashion it is readily explained how the fat could not be emulsified, and how the chyle was limpid and did not contain fatty material Magendie made his experiments on dogs, where the choledochus duct is completely isolated from the two pancreatic ducts It clearly results that, the flow of the pancreatic juice remaining free, the fat would continue to be emulsified and the chyle would remain homogeneous milky white These experiments therefore are exact on both sides, the difference of results is explained by the particular arrangements of insertions of the pancreatic ducts in the kinds of animals which served for the experiments So that these facts really do not contradict each other, but come to the support of

¹ *Journal de physiologie expérimentale*, 3 93, 1823

² There is another small pancreatic duct in the cat, but it is rudimentary, and appeared impermeable to me

that which I have established, namely, that it is the pancreatic juice and not the bile which acts on fat and renders it absorbable

Conclusion At the moment, I believe I have attained the purpose which I proposed at the beginning of this memorandum, that is to say, I believe that I have succeeded in demonstrating experimentally that the pancreatic fluid is intended, to the exclusion of all other intestinal liquids, to modify in a special manner, or said otherwise, to digest the neutral fatty materials contained in food, and to permit in this manner the formation of chyle or their ulterior absorption by the chyliferic vessels

I have just examined the function of the pancreatic juice independently of that of bile In another work, I shall show that in uniting, these two fluids have another (p 81) rôle to fulfill in digestion, and for this purpose, I shall study carefully the properties of the active material of pancreatic juice, which I have succeeded in isolating and characterizing

In closing, I add once more, that these experiments do not weaken in any way the observation of Bouchardat & Sandras,¹ who found that starch is transformed into glucose by pancreatic juice I wish only to remark that this action of the pancreatic juice on starch is not special to it, it is a general property which pertains to mixed saliva, to blood serum, to a large number of other alkaline liquids of the economy,² and also to morbid or altered pancreatic juice, as well as to that which is normal The modification of neutral fatty materials, on the contrary, constitutes the essential and special rôle of the pancreatic juice in the digestion, because it does not share this property with any other fluid of the economy, and it loses it as soon as its active coagulable material is altered

THE END

¹Comptes rendus de l'Institut

²See my work on the rôle of saliva in digestion, in the Archives générales de médecine, 12. série, 1847

MEDICAL CLASSICS

vol 3

February, 1939

no 6



CONTENTS

Portrait of Robert Adams - - - - -	620
Robert Adams	
Biography - - - - -	621
Bibliography - - - - -	622
List of Biographies - - - - -	628
Index to Bibliography - - - - -	628
Introduction - - - - -	631
Cases of Diseases of the Heart, Accompanied with Pathological Observations - - - - -	633



Yours very truly
Robert Adams

ROBERT ADAMS
Irish Journal of Medical Sciences, March 1926

MEDICAL CLASSICS

VOL 3

February, 1939

NO 6



Robert Adams

BIOGRAPHY

- 1791 Born in Dublin
- 1810 Age 19 Entered Dublin University While a medical student, he became the apprentice of William Hartigan, a leading surgeon of Dublin
- 1813 Age 22 On death of Hartigan, Adams apprenticed himself to George Stewart, Surgeon General to the army in Ireland
- 1814 Age 23 Received degree of B A After graduation he made a tour of the continent, studying under the best surgical teachers of the day On his return to Dublin he took out the license of the Irish College of Surgeons and was appointed to the staff of the Hervis Street Hospital and the Richmond Hospital Later he helped found the Peter Street School of Medicine and the school connected with the Richmond Hospital
- 1818 Age 27 Elected a member of the Irish College of Surgeons
- 1832 Age 41 Received the degree of M A
- 1842 Age 51 Received the degree of M D
- 1861 Age 70 Appointed surgeon to Queen Victoria and Regius Professor of Surgery in the University of Dublin
- 1873 Age 84 Died January 13 of heart disease and was buried in Mount Jerome Cemetery, Dublin
- On three occasions he acted as President of the Royal College of Surgeons in Ireland
- He was President of the Dublin Pathological Society

Consulting Surgeon to the Rotundo and Sir Patrick Dun's Hospital

Occupied a seat in the Senate of the Queen's University

EPONYM

SYNDROME OR DISEASE—called also Stokes-Adams syndrome or disease Bradycardia and transient vertigo as signs of fatty or fibrous myocarditis *Cases of diseases of the heart, accompanied with pathological observations* Dublin Hosp Rep, 4 353-453, 1827

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- 31 Incephaloid disease of the lower end of the femur Ibid , 490
- 32 Incephaloid disease of the wrist Ibid , 490
- 33 Hydrocele of the tunica vaginalis Ibid , 492
- 34 Hydrid disease of the testicle Ibid , 492
- 35 Abnormal elbow joints Ibid , 500
- 36 Dissection of the elbow joint Ibid , 501
- 37 Luxation of the bones of the forearm backwards upon the humerus Ibid , 502
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Arthritis	7, 15, 16 52 79 90, 91	1839 1840 1848 1857
Bladder, calculus in	43	1840
Bladder, cystitis	23	1840
Bladder, cysts of	17	1839
Bone cyst	89	1856
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Brain, hemorrhage	72	1841
Brain, inflammation of	66	1841
Brain, softening of	59	1841
Bursa patellae	75	1846
Cerebral apoplexy	28	1840

Diphtheritis	41	1840
Dislocation of elbow	37	1840
Dislocation of knee	82	1848
Dislocation of patella	95	1860
Dislocation of thumb	86	1854
Dislocation of vertebrae	74	1841
Elbow, malformation of	38, 39, 40	1840
Empyema	77	1848
Eyelid, tumor of	55	1841
Femur, atrophy of	20	1839
	62, 63	1841
Femur, disease of	31	1840
Fingers, hypertrophy of	87	1854
Foot, flat	48	1840
Fracture of cranium	54	1841
	99	1871
Fracture of femur	3	1835
	21	1839
Fracture of forearm	5	1839
Fracture of odontoid process	10	1839
Fracture of rib	84	1852
Fracture of vertebrae	9, 11	1839
Fragilitas ossium	14	1839
Glottis, edema of	8	1839
Gout	90, 91	1857
Heart	1	1827
	49, 51	1840
	70	1841
	93	1860
Hernia	2	1833
	6	1839
	57, 68	1841
Hydrocele	33	1840
Hydrocephalus	65, 71	1841
Intestines, protrusion of	64	1841
Joints	4	1835
	19, 22	1839

Joints	24, 25, 26	1840
	35, 36, 42	1840
	56, 67	1841
	80	1848
Larynx, disease of	13	1839
Mammary tumor	69	1841
Mediastinum, tumor of	30	1840
Neuroma	73	1841
Omentum, protrusion of	85	1852
Osteosarcoma	58	1844
Parotid gland	44	1840
Pelvis, caries of bones of	18	1839
Peritonitis	71	1841
Phthisis	77	1848
Pneumonia	61	1841
	81	1848
Presidential address	88	1855
Purpura	60	1841
Richmond Hospital	92	1860
Scrotum, cancer of	76	1848
	96	1860
Spinal cord	46	1840
Stomach, ulcer of	83	1851
Testicle, disease of	34	1848
	98	1868
Wrist, disease of	32	1840

INTRODUCTION

The history of our knowledge of diseases of the heart and blood vessels is an interesting one. From earliest times the pump-like action of the heart has been recognized. The physician of Galen's day, approximately 150 A D, thought that blood was formed in the liver from food in the intestinal tract, and passed to the heart where it ebbed back and forth between the right and left sides through invisible septa. In the heart a mixture was supposed to take place of animal spirits formed in the brain and natural spirits formed in the liver.

For only the last three hundred years has man known of the circulation of blood in his body. Magellan had circumnavigated the globe in 1521, approximately one hundred years before William Harvey in 1628 first published his discovery of the circulation of the blood. He recognized that the heart is a muscular organ which served to propel the blood "in a circle" from one portion of the body to another, the blood going to the body by way of the arteries and returning to the heart by way of the veins.

Diseases of the circulatory system have been recognized and described in relatively recent times. Aortic insufficiency was first described by William Cowper in 1705 and the collapsing pulse which is characteristic of the condition was recognized by Raymond Vieussens in 1715. Mitral stenosis was described by Vieussens in 1705 but the presystolic thrill of this condition was first described by Corvisart in 1806.

It remained for Robert Adams, one of the leading physicians of the Irish School, to fully describe in 1826 a syndrome which is now known by his name and frequently also under the name of Adams-Stokes syndrome. This syndrome of bradycardia with transient vertigo closely simulates heart block although the two terms are not synonymous. Heart block had been described, according to Major, by Marcus Gerbezius in 1719, Giovanni Battista Morgagni in 1769 and Thomas Spens in 1793. Adams's description, however, in 1826, was so complete that this condition now stands out as a distinct clinical entity.

Gaskell in 1881 introduced the term "heart-block" and in 1893 he discovered the auriculo-ventricular bundle now called by his name, a band of neuromuscular tissue between the auricle and ventricle.

Today it is recognized that heart-block or delay or interference of conduction of the excitation wave of the heart may arise in any one of several locations, i e , between the sino-auricular node and the auricle, between the auricle and ventricle (bundle of His), in the bundle branch or in the arborizations of the nerve cells supplying the heart muscle fibers. Heart block may be due to mechanical interference, acute infections, vascular impairment, vagal stimulation, chronic disease processes, drugs and toxic agents (Cecil)

Robert Adams's paper, *Cases of diseases of the heart, accompanied with pathological observations*, by first giving a clear description of the condition of heart block is an outstanding landmark in the history of diseases of the circulation and is, therefore, a fitting contribution to MEDICAL CLASSICS

In the succeeding volume will be published papers by John Cheyne and William Stokes. These papers also concern diseases of the circulation and with Adams's paper form a definite unit on the history of circulatory diseases



Cases of Diseases of the Heart, Accompanied with Patho- logical Observations

BY

ROBERT ADAMS, A B

*Member of the Royal College of Surgeons in Ireland, and one of the Surgeons to
Ferois-Street Infirmary, &c*

Published in Dublin Hospital Reports, 4 353-453, 1827

IN THE following pages it is not my intention to enter into any detailed account of the different diseases of the heart which I shall have occasion to allude to, but to report briefly some remarkable examples of derangement of that organ which have occurred to me in practice I mean to accompany them with such observations only as have naturally arisen in my mind during a painful attendance on these melancholy cases

I shall first consider some morbid affections of the membranous coverings of the heart, secondly, (p 354) those changes which I have observed its muscular structure to undergo, and lastly, I intend to describe and exemplify, by cases, those organic alterations of the auricular and arterial openings of the ventricles which I have remarked more than all the others to derange the function of the circulation

I—OF MORBID AFFECTIONS OF THE MEMBRANOUS COVERINGS OF THE HEART

The pericardium, according to the modern arrangement of membranes, belongs to the fibro-serous class, and consists of two

layers, differing from each other widely in their structure and uses, and very differently affected by disease. The internal serous layer is a transparent membrane, forming a shut sac, immediately investing the heart itself, and reflected from it and its vessels to line the whole concavity of the external fibrous portion, it serves to isolate the heart, and to contain a fluid which facilitates its motions, the external fibrous layer thus lined is partially covered by the pleura, is attached below to the diaphragm, and lost above by surrounding the large arteries arising from the heart. To the assigned use of this fibrous layer to form limits to a cavity in which the heart is to move, it may be added, that interposed between two more delicately organized membranes, it may perhaps occasionally though not always, serve as a barrier interrupting the (p 355) extension of inflammation of one serous membrane to the other, and thus prevent a fatal combination of pericarditis and pleuritis. Examples, however, of such a combination are by no means uncommon, in these cases it is not always easy to determine in which of the serous sacs the inflammation originated, but it is reasonable to suppose, independently of what the symptoms might lead us to suspect, that the pleura, as being the more exposed membrane, and presenting the more extended surface, is generally the first attacked, and that the pericardium becomes secondarily affected. Inflammation sometimes in its extension disregards all difference of structure, and passes from the surface to the heart. This is, I believe, by no means common, but I have lately known a well marked example of it, in the case of a man who received an external injury of the chest to the ordinary consequences of the primary injury succeeded the acute symptoms of pericarditis, which terminated in death. On dissection were exhibited the effects of inflammation of the different textures from the skin to the serous membrane of the heart, which was extensively coated with lymph, the pleura and neighbouring portion of the left lung had been also implicated, the inflammation having passed the barrier, which in ordinary circumstances the fibrous portion of the pericardium would seem to set to it.

(p 356) OF MORBID AFFECTIONS OF THE FIBROUS MEMBRANE

Like the dura mater, the fibrous membrane of the heart, to which it is analogous in structure and function, is liable to ossification, although this change is very uncommon. Senac, Burns, Baillie, each have seen an instance of this alteration of structure, but Laennec, in his *Essay on the Heart*, gives the only minute and full account of a case of ossification of the fibrous layer of the pericardium. I have met with in authors, I may briefly mention that his patient had the common symptoms of diseased heart, and that he died dropsical. On dissection the heart was found enlarged, and at first sight seemed as it were enclosed in a bony case, around the base of the ventricles there was a band about two inches broad, partly cartilaginous, partly bony, unequally thick, flattened, and a little rough on its surface, which sent from its interior a process, separating the ventricles from the auricles, and along each side of the septum of the ventricles, it produced a triangular prolongation, almost entirely cartilaginous, about two inches broad above, which terminated in an angle at a short distance from the apex of the heart, this plate of bone was evidently developed between the fibrous and serous layer of the pericardium, the auricles were larger than the ventricles, the right cavities were full of very fluid blood, of a deep reddish brown colour, the left cavities appeared in the same state, although they were empty when examined, the blood having most probably flowed out when the lungs were separated from the heart.

I shall now relate the only case of ossification of the pericardium I have met with on dissection. Two men, apparently of the same age, about 60, who had been shut up under deck in a vessel lying in one of the docks, and exposed for some time to the fumes of charcoal, were brought into Sir P. Dun's Hospital, both in a similar state of exhaustion. Their bodies were warm, but respiration had ceased for a few moments in both, the usual means were resorted to, and both in a little time revived, one completely, but the other, after exhibiting signs of life for two hours, expired. On examination of his body, which was muscular and athletic, the

viscera were found all in a natural state, except the heart, this organ was a little enlarged, and was very generally adherent to the pericardium, it was encircled, or nearly so, by a zone of bone, about three lines in thickness, and more than an inch in breadth. That this bone was deposited in the pericardium itself was very evident, although in some points it had sunk into the muscular tissue, and penetrated almost to the lining of the ventricle. In consequence of the adhesion of the pericardium to the heart in some parts, it was not easy to decide where the bone was originally situated, but in others it was quite (p. 358) evident that it had been deposited between the fibrous and serous layer, as it was lined by the latter in the same manner we occasionally find the internal membrane in the arteries covering those earthy depositions so very constantly found in the tunics of these vessels.

Upon examining the cavities of the heart, which in Laennec's case was filled with fluid blood, white coagula, of an unusually firm consistence, appearing at first sight to adhere to the ventricle, and being, as it were, organised, were found in the left and right sides of the organ. Mr. Wilmot, Professor of Anatomy and Surgery at the College of Surgeons, who gave me an opportunity of seeing this case, has preserved the specimen of these morbid appearances.

When from organic disease or mal-formation, the structure of the heart is at all deranged, so long as the body is in a state of rest, and that respiration goes on in a regular manner, the effects of the imperfection in structure are little felt by the system at large, but the moment that either the mind is agitated by any strong emotion, or that the lungs are disturbed by any rough exercise, the action of the heart becomes laborious and irregular, or its pulsations intermitting, the person falls into syncope. Such an accidental circumstance may be highly dangerous, for the imperfect organ once interrupted, may not be capable of resuming its (p. 359) functions, a circumstance we should bear in mind in our treatment of such cases.

If the three important organs, the heart, the brain, and the lungs,—the “tripod of life,” as they have been aptly denominated, be not all equally strong at a time when animation has been

accidentally suspended, the weak one cannot be roused to resume its functions. Thus under such circumstances what might have been supposed a simple faint, has terminated in death, and I think in the case I have just given of ossification of the pericardium, in such an altered structure, was to be found the cause of death, as a man placed exactly in similar circumstances, but whose organs were sound, survived. It may be worth noticing that the coagula found in the heart in this instance, composed of the fibrin of the blood, evidently bore the appearance of not having been recently formed, we were quite familiar with the appearance of coagula in the heart, but were struck with the consistence of these, and at first sight imagined that they were adherent to the ventricle, and in a commencing state of organization, but subsequent examination undeceived us.

OF MORBID AFFECTIONS OF THE SEROUS MEMBRANE

Perhaps there is no disease the anatomical character of which is better described than pericarditis, (p 360) its seat is evidently in that serous membrane which, after having lined the fibrous bag of the pericardium, is reflected over the great vessels and the heart, which it every where covers. The general signs by which the disease may be recognized are exceedingly equivocal, and much requires to be done by the physician to clear the obscurity. I have been frequently called upon to examine the bodies of persons supposed to have died of disease of the lungs or liver, and I have found pericarditis the true and single source of death, although during the previous illness the heart was never suspected to be the seat of a fatal affection. I have myself been witness to the treatment of a case of chronic inflammation of the pericardium in a girl aged 14, which terminated fatally, and during the whole progress of the disease phthisis, or rather what was considered hepatic phthisis, was the disease under which this child was supposed to be gradually declining. Her general appearance bore the character of scrophula, a few days previous to her death I took the following notes of her state, which I copy verbatim. "Sarah Langly is greatly emaciated and very weak, yet does not wish to remain in bed, but prefers to be dressed, and

to sit most of the day crouched by the side of the fire, the countenance is pale, and bespeaks great distress in the chest, yet the lips are not livid, but of a good color, the eyes appear large and brilliant, the skin is harsh, dry and rough, and cannot be by any means made clean, there is a general disposition to a growth (p 361) of downy hair every where on the surface, the skin is never relaxed by perspiration, the bowels are regular, but occasionally affected by diarrhea. The tongue is reddish, and but little different from the healthy state, the respiration is 54, the pulse 156 in the minute. There is much wheezing in her respiration during the night, and frequent cough, with but little expectoration. Upon exposing the chest and abdomen with a view to make a more particular examination, the former presented an unusually good formation, it was equally and uniformly convex, and the outlines of what we supposed a much enlarged liver could be traced through the parietes of the abdomen." The child lived about a week after these notes were taken.

DISSECTION

The lungs were sound, but the pericardium was more enlarged than I had ever seen it, and contained, I am sure, about 20 ounces of purulent fluid, much resembling that which we are familiar with, as proceeding from scrophulous diseased joints. The organized membrane which invested the heart's surface, and which lined the reflected layer of the pericardium, was granulated, and presented much more the appearance of that membrane which lines a fistulous abscess than the yellow tenacious lymph, which we uniformly see in cases of true acute pericarditis. The lungs were sound generally, although a few (p 362) scattered tubercles confirmed the suspicion of a scrophulous constitution, which her general appearance indicated. The liver was perfectly sound, but a quantity of fluid, which the pericardium contained, acting through the diaphragm on the liver, had depressed that organ, and caused it to present itself in an unusual manner towards the anterior part of the abdomen, by which we were led into the error of imagining that the liver was enlarged, whereas the true seat of the disease was the pericardium, and the evident cause of death

was to be found in a species of chronic strumous inflammation of that membrane

ACUTE PERICARDITIS

In January 1824, I was called upon to examine the body of a young lady aged 16 years, who died of an illness of only about 14 days duration. My attention during this examination was particularly directed to the brain and lungs, which were supposed to have been the seat of the fatal illness. I found, however, the brain and abdominal viscera perfectly sound.

Upon raising up the sternum a large mass of yellow tenacious lymph covered the pericardium, and filled the cellular membrane which connects this bag to the back part of the sternum. Upon cutting into the pericardium a quantity of sero-purulent fluid flowed out, the whole of the (p. 363) heart's surface was covered with a thick tenacious layer of organized lymph, rough, and reticulated on its surface. The concavity of the pericardium presented the same appearance, and several minute red specks denoted the organized state of the new membrane, which had been produced by very active inflammation, yet the exact seat of which had never once been suspected by two very eminent medical gentlemen who had seen this lady in her short illness. The lungs in this case were perfectly sound, the vessels of the bronchial membrane, particularly at the bifurcation of the trachea, were in a slight state of congestion.—It may not be uninteresting here to relate some of the particulars of this case. The young lady's health had been uninterrupted until about a week before her last illness, at a time when her catamenia were present, she imprudently plunged her feet and legs into cold water, a slight pulmonic attack, as it was supposed, immediately succeeded, from which apparently she recovered. Her spirits, however, which were not naturally high, were observed to droop, and she became averse from exercise. The catamenia did not recur at the usual period, but about this time she became affected with oppression of her breathing, frequent short cough, she was pale and languid, had a hot skin, a small, quick, and irregular pulse, total loss of appetite, and in short had many of the symptoms of ordinary fever, which compelled her at once to take to her bed. She had, however,

neither headache (p 364) nor pain anywhere, her tongue was not foul, nor was she thirsty

She expressed no wish for any thing, but lay all day on her left side, or on her back, teased almost continually with a short dry cough, she had occasional paroxysms of dyspnoea, which were not very urgent, and had much the appearance of being the result of nervous debility. She had frequent weaknesses, which never amounted to complete syncope, her mind was perfectly calm, and never wandered, her intellect was perfect up to the few moments before she breathed her last

It was remarkable that during her whole illness she scarcely got two hours sleep. With respect to the treatment, it consisted in two large bleedings from her arm, and in the frequent application of leeches and blisters to her chest, and purgatives. To procure rest anodynes in different forms had been exhibited

Thus while the dissection in this case gave us an instructive, and at the same time an humiliating lesson, it also afforded a consolation to the medical attendants and friends of the lady by showing that every measure had been resorted to which a better knowledge of the actual seat of her fatal illness could have suggested

All cases of acute pericarditis are not so obscure (p 365) nor so likely to be overlooked. I have seen many cases of metastasis of rheumatism to the heart which could not be mistaken. The sudden cessation of pain elsewhere, and the concentration of the distress and suffering about the heart, with the difficulty of breathing, and appearance of anguish in the countenance, are in many instances so striking as to fix the observation of the most inattentive, and to excite the physician to meet in a prompt and decisive manner such threatening symptoms, his utmost efforts however will often prove unavailing in these cases

METASTASIS OF ACUTE RHEUMATIC INFLAMMATION FROM THE
SYNOVIAL MEMBRANES OF THE EXTREMITIES TO THE
SEROUS MEMBRANE OF THE HEART

Rose Fox, aetat 6 years, in the month of March 1825, was afflicted with a very severe attack of acute rheumatism, which

engaged successively the principal joints, and shewed itself also in most of the muscles. Active measures, consisting of venesection, purgatives, together with the use of mercurials and the warm bath, proved successful. The child's convalescence was not, however, rapid, it was not for two months that she was restored to perfect health. In the latter part of August she became again afflicted with pain and swelling, and redness of the ancle and knee joints, the least motion was insupportable. There was great (p 366) heat of skin, more particularly of the affected articulations, and remarkable frequency and hardness of the pulse, a loaded tongue, anorexia, in short a combination of symptoms denoting high inflammatory action, although these were actively met by the appropriate remedies, they changed but little until the fourth day, about which time the inflammation leaving its original seat passed along the muscles forming the parietes of the abdomen and thorax, and in the latter region very particularly fixed itself on the left side over the heart. Presently, in addition to the hardness and frequency of the pulse, it presented a remarkable tremulous vibratory feel, and the little patient exhibited more general distress. The horizontal position could not be borne, the limbs could now be tossed about without the slightest pain, the heat, redness, and swelling had disappeared from the joints, there was however neither mitigation of pain, nor of tenderness on pressure of the abdominal muscles, nor relief from the deep distressing anxiety and pain of the heart, to which the little patient usually pointed when asked about her sufferings. The breathing was hurried and distressed, not simply as in ordinary fever, but there was a corresponding anxiety of countenance, and she continually maintained the sitting posture, the head inclined forwards, and required support of the hand of her attendant, such was the debility. She had at this period some cough, and expectorated with difficulty a viscid mucus. She (p 367) died on the 18th day of her illness, having preserved her mental faculties in a perfect state throughout. The same remedies were tried in this latter illness which had been found useful to the patient on a former occasion, when labouring under similar symptoms. In short every measure which a firm conviction that

the heart was now implicated could suggest was resorted to. In addition to mercurials, combined with Dover's powder and antimonials, and active venesection, blisters were applied to near, and also to distant parts. The warm bath was had recourse to, the colchicum was fully tried, and every effort made to produce salivation, but all were in vain.

DISSECTION

The body was remarkably pale, and had rather a bloated appearance. The abdomen, particularly examined, exhibited no trace of inflammation. The lungs were perfectly healthy, but the pericardium was much enlarged and evidently distended by a fluid. On opening this bag, a quantity of seropurulent fluid, with flakes of lymph floating in it, poured out. The surface of the heart and corresponding part of the pericardium were coated with lymph, and presented the usual appearances of acute pericarditis. Indeed I never saw the anatomical characters of acute pericarditis better expressed, and I have preserved it as a specimen of the post mortem appearances which (p. 368) correspond accurately to the description which Baillie, Corvisart, and Laennec have given of them.

I have seen some cases, which I have not the smallest doubt were cases of rheumatic pericarditis, yield to active medical treatment timely resorted to, but have often seen others, as will be, I fear, the fate of most, terminate fatally, and have ascertained the correctness of my conjectures by examination of the body after death. Sometime ago a boy about fourteen years of age died of this disease in Jervis-street Hospital, but the progress of the case and the appearance on dissection were so similar to the foregoing, that I shall not take up time by relating them.

Indeed it is scarcely necessary to dwell upon this subject, as rheumatism of the heart, since Doctor Baillie introduced the subject to notice, has been much spoken of.

But it would appear that the distinction between simple rheumatism of the heart and the dangerous case of rheumatic inflammation has not been sufficiently insisted upon. In the one case the organ is simply, and often but transiently affected, just

as any other muscle is, the person has perhaps been affected with rheumatic pains in the loins, with but little fever, these suddenly leaving this region run to the diaphragm, and cause a temporary affection of the breathing, with what the patient calls spasms in chest. The (p 369) countenance undergoes sudden changes. there are at such moments strong beats of the heart, and intermissions of the pulse sensible to the patient, and in females I have sometimes seen such attacks end in an hysteric paroxysm, and all symptoms subside when the lumbar pains returned. In such cases, the tongue is somewhat foul, the skin is frequently relaxed by profuse perspiration, and the urine is remarkably turbid, but the pulse has neither the frequency, hardness, nor peculiar vibratory feel that it has in the other, and more dangerous case. the countenance does not betray that anxiety, or, as it is denominated by some authors, that anguish which it almost uniformly expresses when the membranes of the heart are affected with acute inflammation, from whatsoever cause proceeding. Although simple rheumatism of the muscular structure of the heart may occasionally pass on to carditis, or to an inflammatory affection of the serous membrane of the heart, there cannot be a doubt that the two cases are very distinct from each other, and require treatment so different as to make it highly important for the practitioner to be aware of the risk of mistaking the comparatively simple case of rheumatism of the heart, for the far more urgent and dangerous one of rheumatic inflammation of its serous membrane. The latter disease I have usually seen in children, and persons about, and under the age of puberty, in whom, metastasis seems much more liable to occur, than in those more advanced in life, and the sudden (p 370) translation of the rheumatic inflammation to the heart has usually occurred where the synovial system of the extremities was the original seat of the disease. when the muscles have been affected with acute rheumatism, metastasis of the heart has not, to my knowledge, been frequent, although I have seen the diaphragm affected by it in such a manner as to excite apprehensions for a time, that the former more important organ was implicated. There seems to be a greater disposition in the acute inflammation to pass from the

synovial membranes to the serous, than to any other tissues, which is not so much to be wondered at, when their great similarity of structure, appearances, and functions, is considered

If rheumatism affect the heart in this two fold manner, it may be asked whether this important organ is ever similarly affected by gout That this disease does very frequently affect the heart, exciting agonizing pain in the breast, and giving rise to every species of irregularity in the heart's action, is well known to physicians but whether any fatal case of metastasis of true arthritic inflammation to the serous membrane of the heart has ever been observed, I am unable to affirm from my experience or enquiries, yet I think it probable if such a case has not as yet been seen or described, that at some future day the attention of the physician will be called to it gout, above all other diseases, being prone to metastasis, I cannot conceive that the heart (p 371) should escape, the comparative rarity however of gout in these latter times may account for such a case not having been seen, or more properly speaking, not having been yet observed upon If this were not a just view of the case, gout would form an exception to every other species of inflammation liable to metastasis

Erysipelas undoubtedly affects the heart, I have myself known two cases of erysipelas of the head and face which terminated fatally by metastasis to the heart In one the erysipelas succeeded to a wound in the head, in the other, it came on spontaneously In both, as soon as the external redness receded, the breathing became distressed, the countenance agitated, and rest in the horizontal position impossible Yet the general symptoms of pericarditis were so obscure, as to excite no suspicion in the mind of the attendants as to the real nature of the case Both were weak and debilitated patients, in which this affection supervened towards the close of a long illness neither lived more than two days after the sudden disappearance from the surface of the erysipelatous redness The countenance, the breathing, the state of the pulse, and apparent debility in both, seemed to forbid any active interference on the part of medical attendants, who had no suspicion of the real nature of the case, (so obscure were the symptoms of pericarditis) until the examination of the body

disclosed it. The pericardium contained (p. 372) some turbid fluid, but had contracted no adhesions to the heart. A quantity of lymph, evidently recently effused, lined the concavity of the pericardium, and thickly and unequally covered the surface of the heart itself—appearances which left no doubt as to the immediate cause of the death of these individuals. The late Mr. Thomas Roney and Mr. Cusack met with similar cases, and the latter preserves a specimen of the morbid appearances which the dissection of a similar case presented, in the Museum in Park-street.

These cases, though quoted from memory, and not accompanied with all the necessary details, appear to my mind, to afford very sufficient evidence of such a metastasis, or as some would call it, conversion of disease: such cases have been hinted at, by authors, as having sometimes occurred, but as far as I know, no authentic instances of erysipelas transferred from the surface to the serous membrane of the heart, have ever been laid before the public.

II—OF CHANGES AFFECTING THE MUSCULAR STRUCTURE OF THE HEART

The muscular structure of the heart, from various causes which tend to excite a more active nutrition in it, may become increased in its thickness, and the cavities of the organ may at the same time become enlarged. The causes of these changes are sometimes very evident: thus, for (p. 373) instance, the active enlargement of one of the auricles or ventricles immediately contiguous to a narrowed aperture, sufficiently demonstrates that the parietes of this cavity have become increased in thickness, in obedience to a well known law, to which all the muscular system yields, a law which invariably adapts the power of the muscular fibre, to the resistance it has to overcome. Thus, when an aneurism exists at the arch of the aorta, there is a difficult transmission of blood through it: the left ventricle uniformly increases in thickness, and its cavity at the same time becomes dilated, affording us an example of the active enlargement of this ventricle. If there be a contraction between the left auricle and ventricle, the latter is diminished in size, while the former becomes actively

enlarged, the pulmonary veins are dilated as well as the pulmonary artery and whole of the right side of the heart, as may be proved by repeated examples

Sometimes, without our being able to detect any organic cause, we shall observe cases of active enlargement of the heart, in which all the cavities are equally concerned here follows a well marked instance of this description in which the increase of the whole organ amounted to such a degree, that the left lung was nearly obliterated by the pressure of the heart, in which there was no valvular disease, no adhesion, in short, to our senses, there was no apparent organic cause for the enlargement

CASE OF ACTIVE ENLARGEMENT OF THE HEART WITHOUT ANY
VALVULAR DISEASE

No 1 A medical gentleman aet 60, of a sanguineous temperament, and remarkably anxious turn of mind, had, during the earlier part of his life enjoyed good health, with the exception of three rheumatic fevers, the last terminated in a severe attack on his chest, from which period he never was affected by rheumatism either in its acute or chronic form, but his chest became particularly delicate, and during the winter months he was very susceptible of cold, he had habitually a severe cough, and complained of palpitation of the heart and difficulty of breathing, which was much increased by a dense or smoky atmosphere, by going up stairs or any ascent, he was heretofore fond of horse exercise, but he could not ride at a trot, as any rough or jogging motion invariably induced a strong paroxysm of palpitation of the heart His appetite was good, but his digestion was wretched, and except when he paid the greatest attention to his diet, he was greatly distressed by flatulence his sleep was very disturbed and uneasy, and he never could rest, except when lying on his left side His pulse was generally about 70 in a minute, regular, but always remarkably strong, full and vigorous The chest was well formed, the pulsations of the heart were inordinately strong, and extended over the whole left side of the chest, and (p 375) often excited a good deal of alarm in his mind, and more than any other of his symptoms impressed him with a dread that the heart was the seat

of his disease, although usually said to be asthmatic, his breathing was at times tolerably free, when interested by any favourite professional subject, I have known him to speak for more than an hour without interruption, the difficulty of breathing, however, used to come in violent paroxysms, and on these occasions he always experienced some relief from leaning forward when obliged to go a distance into the country, he would sometimes seek relief by kneeling down in his carriage, and resting his elbows on the seat would travel miles in this attitude

Towards the latter period of his illness his cough became very distressing, and the dyspnoea more continued, he was obliged to confine himself entirely to the house, his limbs began to swell, and the abdomen to fill with water, his stomach became very irritable, and refused all medicine, and the pulse which was heretofore regular though remarkably strong, full and vibrating, became latterly intermittent, his intellect was undisturbed until the last 24 hours, when he lost all external sense, became comatose, and died in a subapoplectic state

DISSECTION

The external appearances were those which are usual where dropsical symptoms have been (p 376) present before death, a double inguinal hernia (caused probably by the cough and distress in breathing) remained unreduced, the internal organs were all sound except those contained in the thorax, the cartilages of the ribs were completely ossified, and required the use of the saw, the left lung was compressed and reduced to so small a size, and was so condensed in its structure, that it was evident that it must have been incapable of performing any function, there was no water in the chest The heart was enlarged to more than twice its natural size, but differed in no other particular from a well formed heart, proportioned in every respect as to itself, but only disproportioned to the structure, and probably also to the delicate tissues of the individual who was afflicted with this most distressing disease There was in this case no adhesion of the pericardium to the heart, no valvular disease nor contraction to account for the increased growth of the organ, nor could the com-

pressed lung, or its obstructed vessels, be assigned as its cause this probably was only secondary, and rather the consequence of the enlargement, and at all events could only account for the increase of size of the right ventricle Mr Wilmot made the dissection in the presence of Dr Perceval, Mr Duggan, and myself

With respect to the treatment, it was so nearly similar to that which was for a time found useful in the following case, that I shall omit to (p 377) dwell on it here, I may observe, that the decided benefit he occasionally derived from losing some blood from his arm was most remarkable From having been much with this gentleman for the last two years of his life, and so often observed the great difficulty of breathing, I may state my conviction, that on different occasions he would have been suffocated had it not been for the timely and decided relief venesection afforded him I shall now copy from my notes the following case, a little more at length than I would otherwise wish to do, because I conceive it presents a very striking example of that too common disease, active enlargement of the heart, and in the various changes which these notes record, are to be seen the occasional benefit to be derived from judicious medical management of a disease, which, like most other organic affections of the heart, is incurable

NO II —CASE OF ACTIVE ENLARGEMENT OF THE HEART WITHOUT
ANY VALVULAR DISEASE

A gentleman, aet 60 years, of high stature, and a spare though muscular frame, who has led a life of much anxiety and care, the traces of which are observable in his countenance, came to Dublin for medical advice he was afflicted with severe cough, difficulty of breathing, and palpitation of the heart, he was restless and irritable during the day, and at night such imperfect sleep as he could take, was frequently interrupted by (p 378) unpleasant dreams, out of which he would start up with strange imaginations his stomach was out of order, and he was much distressed after his meals by flatulence, rendering his respiration at these periods

more difficult, his skin was cool, his tongue white, though not loaded, his appetite tolerable, and he bore a journey of 30 miles to town without feeling fatigued, the chest was large and well shaped, except that there was an unusual prominence in the situation of the cartilages of the lowest ribs at the left side. The pulsations of the heart were so widely extended as to occupy before and behind the whole left side of the chest, and beat with such force, that the patient's bed appeared to shake at each pulsation. The pulse at the wrist was remarkably full and strong, 90 in a minute, with one regular intermission in each 20 pulsations. This gentleman was himself conscious of every motion of the heart, and he told me, whenever he lay down its pulsations became slower. I found, upon making the experiment, that his remark was correct, while I felt the pulse at the wrist he suddenly assumed by my desire the horizontal position, for the first moment the pulse was irregular and tremulous, and fell exactly to the rate of 30 for a minute, and again resumed the former number of its pulsations. I made the experiment different times with the same result. Anxious to compare his symptoms with those observed in the preceding case, I asked him could he rest at night indifferently upon either side, or bear any rough or (p 379) jogging motion? He told me, for many years he could not sleep upon his right side, that he used to be fond of horse exercise, but latterly could not ride at a trot, as it instantaneously brought on violent palpitation of the heart, with an attack of breathlessness. The nature of the disease was now too evident. The previous history of this gentleman's case was, that he had been always tolerably healthy, but that in the last fifteen years he had two attacks, very different from each other, which threatened his existence from their duration or violence. The first was a profuse epistaxis, supposed to be connected with some derangement in his liver. The account of the quantities of blood he lost on this occasion is nearly incredible, ever since he has been sensible of the unpleasant symptom which he now has to so great a degree, the palpitation of the heart. The last attack was supposed to be a violent pneumonia, it was attended with high

delirium, and was combated with the most active venesection, in one day it was thought necessary to take away 60 ounces of blood

Although there was now every reason to believe that active enlargement of the heart was fully established, and that to this might be referred all the symptoms under which this gentleman laboured, still his physicians had a hope that many of them were of the nervous character, and that medicine was available to relieve them. The faulty condition of the digestive organs was first (p 380) considered in the treatment, to procure rest, the want of which was most complained of, the extract of henbane was prescribed, every effort was made to compose him and remove his own apprehensions, he was ordered to return to the country and amuse his mind, but avoid business

October 10, he returned to town worse, and much disappointed at having derived no relief from the medicines prescribed. His countenance, naturally pale and sallow, was now generally livid from excessive coughing, and was at the same time expressive of much anxiety. He was restless, and unwilling to remain more than a few moments in any one position, and he affirmed, that for several nights he did not enjoy one moment's sleep. His cough was very severe, attended with a thick viscid expectoration, and lasted in fits for hours, his breathing too was very difficult, his pulse 100, remarkably firm and full, and now there was no intermission. Various anodynes were fruitlessly tried to procure rest, aether did not for a moment relieve the dyspnoea. Smoking the stramonium, recommended by a friend, was nearly producing suffocation.

Such were the distressing symptoms this gentleman laboured under, when, on consultation his medical attendants determined to try the effect of venesection, and the most rigid antiphlogistic plan of treatment, to exhibit active purgative medicine, and in addition, it was (p 381) thought advisable to place a caustic issue under the left breast, all which means were immediately resorted to, but without any sensible benefit for some days, when from the distress in the chest, and the urgency of the cough, it became

necessary again to bleed him, which was attended with some little relief

October 16—His illness now assumed more of the febrile character, and it became necessary to confine him to bed, his body became hot, his tongue foul and coated, to the point brown and dry, he was disposed to sleep a little, but was repeatedly roused by fits of coughing. In those short intervals of sleep he raved a good deal, his wanderings were rather disposed to a pleasant than melancholy turn. He knew his medical attendants, was quite collected in their presence, but was reported not to be so in speaking to those constantly about him, his pulse ranged about an hundred, and was still without intermission, his breathing was heaving and irregular, and very frequently suspended for a moment or more. He had yesterday a profuse perspiration, after which his fever subsided much, and he awakened perfectly collected in his mind.

He had no consciousness of the last fortnight, he complained now of being very weak, his flesh was greatly reduced, and he desponded much about himself, but his tongue was clean, his pulse about 82 (the regular intermission returned), his (p. 382) cough much softer and less frequent, and the dyspnoea altogether forgotten, nor was it brought on by the presence of much smoke occasionally in his chamber. During this illness he had been bled twice, had active purgative and diaphoretic medicines, and he drank nothing but whey or barley water. The bowels were now attended to, and easily acted upon by medicine, the secretion of urine was scanty and the oedema of the feet and ankles was increasing. The tincture of digitalis was exhibited, and he took half a grain of opium every night, he was now allowed to leave his bed, and to take vegetables for dinner, his strength daily amended until the 10th of November, when his cough had become troublesome, and there was some bloody expectoration, it again became necessary to bleed him.

From this time he improved progressively, for three weeks he was able to be out in the open air for several hours during the day, and a slight opiate at night procured rest, his cough and dyspnoea

were no longer complained of. He felt so well he became anxious to dine at his usual hour, and resume his ordinary regimen. In a few days the effect of the animal food, which was reluctantly allowed him, was quite perceptible on his person, but it was also remarked that his countenance became anxious, his breathing hurried and irregular, his cough returned, and his rest was nearly as bad as heretofore, the state of his pulse, together with the other symptoms, again called for the lancet, venesection was now (27th of November) performed, and was soon followed by the accustomed relief.

R̄ Calomel gr iij Pulv Ipecacuanhae Comp gr iv. divide in pilulas duas hora somni sumendas

Animal food was altogether prohibited, a small quantity of white fish allowed for dinner occasionally, and for the swelling of the feet and legs, the tincture of digitalis was in increasing doses daily exhibited. In this way was this gentleman's life prolonged, every symptom was palliated as it presented itself, the cough and dyspnoea were always more or less relieved by venesection. the swelling of the limbs would remain obstinate for a time, and general dropsy be apprehended, then the kidneys would act, and the quantity of urine which would be evacuated was surprising. We ascertained that for several nights in succession above four quarts of urine were evacuated. at this time the thirst was not urgent, and he drank but little, the oedema of the feet and legs, after these extraordinary evacuations, would totally disappear, and perhaps for weeks there would be no return of the swelling.

The diuretic medicine would now be laid aside, but its effects would continue, and whenever the quantity of urine flowing naturally, or produced by medicine, was abundant there would be no oedema. He rallied so much that from January (p 384) to the middle of May, he was capable of attending to business. he had returned to the country early in the spring, he no longer required an opiate to procure rest. The cough, dyspnoea, and palpitation, were not troublesome so long as he strictly adhered to the vegetable regimen, but the slightest deviation from the

general plan laid down did not fail to be followed by some threatening of his former symptoms

Although he could not now be said to enjoy health, still he would have felt greatly satisfied with the comparative freedom from illness which he enjoyed, if it were not for the constant intrusion on his mind that he was altogether indebted for it to the strict regimen he observed

About the middle of May the swellings again appeared in his limbs, and increased rapidly, and all his former symptoms returned

The dyspnoea was particularly urgent, a large bleeding was now performed, at his own request, without the least benefit Towards the latter end of June, the diuretic medicine, no matter how varied, produced no other effect than to sicken the stomach The abdomen became much distended with water, and there was sufficient evidence of effusion into the chest having taken place

On the 7th of July his countenance changed (p 385) suddenly, he complained of violent pain in the abdomen, which would not bear the slightest pressure, every remedy that was tried failed to alleviate it even for a moment In this manner an unexpected mode of death by peritonitis supervened, which terminated the sufferings of this gentleman on the 8th of July, 1819

EXAMINATION OF THE BODY

Twenty-seven hours after death, July 10th, 1819

External surface The inferior limbs anasarctous The face bloated The abdomen much swollen, as if distended by air and water

Cavity of the abdomen The serous surface of the stomach and intestines presented evident marks of recent inflammation, coagulated lymph of a dark brown colour covered in patches the ileum and stomach, and beneath and about this lymph the small vessels were injected with blood

The liver was changed to a light brick colour, and was connected by old adhesions to the concavity of the diaphragm, from which it was inseparable The serous covering of the liver was

opaque and thickened, and this membrane, where it covered the gall bladder, was whitish, and did not permit the usual transudation of bile. Sections of the liver exhibited no morbid alteration of its interior.

The spleen was pale and much contracted in size. The right kidney, smaller than natural, contained hydatids. The left kidney, was quite natural, as were the ducts and vessels of both organs. A turbid brown coloured serum occupied the cavity of the abdomen.

Thorax The cartilages of the ribs were completely ossified, and required the use of the saw. The cavity of the right side contained about seven quarts of whey-coloured serum. Two-thirds of the right lung were converted into a solid substance, which portion sunk in water, the rest floated, and was pervious to air. The left lung was perfectly sound, and had contracted no adhesions to the side.

When the sternum was raised to which the pericardium was strongly adherent, it was evident that the heart was greatly enlarged.

Almost the entire of the contiguous surface of the heart and pericardium was firmly connected by a cellular adhesion. The heart itself was fully three times its natural size. The parietes of both ventricles were greatly thickened, but particularly the left, at one spot only, toward the root of the pulmonary artery, the right ventricle appeared thin and weak. The muscular structure of the interior of the organ was much developed. The carnae columnae of the right side were remarkably (p. 387) prominent, and those of the left also were greatly thickened and enlarged. The valvular apparatus of both sides was perfect. We could discover no bony or earthy deposition either in the heart or in any part of the arterial system. All present agreed that they had never seen a heart so much enlarged.

In these two cases of active enlargement of the heart, there were many points of resemblance. They were both men of the same temperament, and anxious turn of mind so often found associated with this disease, the same description of motion and exercise brought on in each an increase of their most distressing symptoms,

and the same remedies, or rather palliatives, were resorted to for a time with the same success in both

In the first case, the origin of the disease was referred to rheumatism in some shape, as the rheumatic fevers which used to visit this gentleman at stated intervals ceased to recur from the time his chest became engaged, an effect which has been before observed, and if it be admitted that repeated attacks of simple rheumatism of the heart may cause its enlargement, it places in another point of view the propriety of keeping distinct in our mind the two forms of rheumatism of the heart, viz that wherein the muscular structure alone is the seat of the disease, and the far more urgent one of rheumatic inflammation of its (p 388) serous membrane, an example of which, page 365, I have before given, and which may be contrasted with that now under consideration

In the 2d case, the symptoms which first announced that there was something irregular in the action of the heart, were referred to a very early date, even to the time when this gentleman was only recovering from the profuse and continued haemorrhage with which he had been afflicted at a remote period before his last illness. It appears to me by no means irrational to conclude that the very excited condition of the heart, which always attends and succeeds profuse bleeding, must in certain constitutions be favourable to the development of such a disease as this patient laboured under

The acute attack, attended with high delirium and great vascular action, supposed to have been pneumonia, which a year before he died, visited him, was no doubt pericarditis, which terminated in extensive adhesion of the pericardium to the heart, a new cause for the increase of growth of the organ, and the more rapid progress of the disease afterwards

Although we not unusually find the heart enlarged where the pericardium is adherent to it this has never been, as far as I know, referred to, as a cause of its inordinate growth, yet when we reflect that in the natural state the heart has (p 389) no vascular connexion with the surrounding organs, and is only supplied with two small arteries, we can readily conceive what a new impulse its nutrition must derive from the immense number of

vessels which from the adherent pericardium will pass directly into the muscular substance of the heart Under such circumstances we may as fairly attribute enlargement of the heart to the pericardium, as the unlimited growth of a tumour to the organised cyst which contains it

In this latter case, No 2, there was more inflammatory action than in the former, hence probably the great benefit derived from rigid abstinence for a time, and the very strict antiphlogistic regimen that was observed, the least departure from which brought back a renewal of the symptoms In the former case diet was not so much attended to by the patient, and the relief he so frequently, and so immediately obtained from bleeding was to be accounted for, not so much in that it counteracted inflammatory action as that the irritability of the heart was diminished by it, and the compressed lungs relieved of too great a quantity of blood circulating through them In these two cases, towards their close, dropsy supervened, which for a time was controlled by diuretic medicines, these, at length, the stomach, in every shape, rejected The limbs then swelled, and the breathing became difficult at a time when, from the general debility, bleeding could not, as before, be resorted to

(p 390) In the first case, for 24 hours before death there was complete insensibility, and loss of voluntary motion, &c and the subject of it died, as it is stated, in a subapoplectic state, in which there was nothing very unusual But in the history of the termination of the second case, it may excite surprise that acute peritonitis should have visited a person so worn out, and debilitated by the combined effect of his original disease, and the symptomatic dropsy, yet I have seen acute inflammations of the serous membranes set in with violence and rapidly put a fatal end to chronic disease, I have moreover known many instances of dropsy to merge spontaneously in acute peritonitis

Although active enlargement of the heart, like most of the diseases of the organ, is towards its close usually attended with dropsy, yet sometimes before the period that disease might be expected to set in, life is brought to a sudden termination by apoplexy

The opinion has not obtained universal assent, that in such cases enlargement of the heart is the cause of the sudden event, yet it would appear to me that the observations of Bricheteau, Richerand, Corvisart, and Johnson, are conclusive on this head

In the following case, although apoplexy was not the immediate cause of death, it is probable (p 391) that such would have been its mode of termination, had not the aorta given way This case strikingly elucidates the connexion between apoplexy and active enlargement of the heart

February 20th, 1822 I was called to visit a gentleman in my neighbourhood, aged 50 years, who had suddenly fallen down, as reported to me, in an apoplectic fit I found him in a state of complete insensibility, his face (naturally pale and sickly) was now red and bloated, his breathing stertorous, with a slow pulse, the action of the heart and carotid arteries unusually strong I lost no time in taking away blood from his arm, and in resorting to the usual means in such cases, he slowly recovered his senses, not however without its having been found necessary to repeat the venesection, which was determined upon in a consultation between Mr Carmichael and myself Leeches were also applied to the temples Upon inquiry into this gentleman's mode of life and state of constitution, I was informed that he had been tolerably healthy, except that he was liable to slight attacks in his chest that he led a very active life in the country, and was accustomed to much exercise that about the year 1819, his affairs suffered a great reverse, and that ever since that period his spirits drooped, he became averse to exercise, and complained of palpitation of the heart, that in the last year he had two apoplectic attacks, exactly resembling that which I had just witnessed, from these he recovered without any paralysis of the muscles, except that his mouth was drawn a little to one side, and after each attack his articulation became less intelligible, his mind became childish, his temper irritable, and his memory failed him The effects of this last attack of apoplexy passed off like the former, and he remained for three months much as he had been before it In April I was again called upon to visit him, as he was taken alarmingly ill I found him in a faint, though not

insensible, his countenance ghastly, his pulse weak and rapid, his extremities cold Venesection, which on all former occasions seemed to afford him almost immediate relief, from the state of the circulation was not now resorted to He lived but fourteen hours

DISSECTION

The brain was of a yellowish colour, and somewhat looser in its texture than natural, but there were no apoplectic cells, no effusion of blood, nor appearance of there ever having been any extravasation of blood in it The lungs were sound, but the pericardium was largely distended with blood, partly fluid, and partly coagulated, when this was removed it was found to have proceeded from a rent in the aorta about a quarter of an inch in length The whole heart was greatly enlarged, and the left ventricle was much increased in thickness, the heart was otherwise natural, the remaining viscera were sound Dr Law assisted me in this dissection The specimen is preserved by (p 393) Dr Macartney, Professor of Anatomy and Surgery in Trinity College

In this case it appears but rational to conclude that the apoplectic symptoms and attacks with which this gentleman was visited, arose from the too great violence with which the left ventricle poured the blood upon the brain, and which might have produced death as in ordinary apoplexy, by distending so as to rupture some of the capillary vessels of this organ, had not the great trunk of the arterial system first given way

There is a sufficient number of cases before the profession to prove beyond all manner of doubt this connexion between apoplexy and active enlargement of the heart, but it appears to me that the attention of the physician has not been sufficiently directed to the fact, that apoplexy may be the result of a state of the heart altogether different from that we have been just considering, I shall however reserve any observations I may have to make upon this subject, until I shall have related the succeeding case, which bears upon that point, and at the same time exhibits an example not very common of a change of the muscular

structure of the heart into fat. I shall merely premise, that in this case the impulse a tergo could have had no influence in producing the apoplectic death by which this case terminated, indeed the left ventricle was so weak, and its parietes so reduced, that at first sight it excited (p 394) our surprise that it was at all capable of carrying on the circulation, which was not a little increased, when on a close examination it was discovered that the valves of the aorta had become, from cartilaginous and earthy depositions, so rigid as to retain water, whether poured upon them from the artery or from the ventricle, the contact of their edges was preserved in such a manner that it required that a fluid should be injected from the heart with some little force to render this arterial opening pervious

That the muscular fibre entering into the composition of the muscles of the body was occasionally to be found converted into fat, has been long known, but that the internal muscles, or those more essentially concerned in carrying on the vital functions were subject to this change, seemed until lately to have wanted the confirmation of a single well authenticated fact We find late authors, no doubt, frequently alluding to such a morbid condition of the heart, but they rather refer us to older writers, than adduce examples of it from their own experience Corvisart, alluding to this state of the heart, says modern anatomists have observed it, "no doubt they will some day publish these interesting facts, but speaking for myself, I have never seen this change" Later writers express their opinions, that some mistakes may have arisen from the distinction not having been made between the case of true conversion of (p 395) the muscular tissue into fat, and that in which a thick layer of adipose matter envelops the whole of the heart's surface, they doubt whether this latter condition of the heart should be considered pathological, or could produce symptoms immediately depending on this accumulation, and look upon this case as very different from that degeneration of the muscular tissue into a fatty substance, which in the external muscles, as the *solaei*, &c is so often observed Although such observations may be in a great measure true, and it may be difficult to demonstrate the exact difference between these cases, or

how such changes take place, it is no less certain that the muscular substance of the heart occasionally disappears (the thin reticulated lining and weakened septum alone remaining), while true adipose substance is found to have taken possession of the place which muscular fibre before occupied. It seems moreover proved that this morbid condition of the organ may produce death, which from the few facts of this nature with which we are yet acquainted, we suspect will be sudden, and generally preceded by the usual symptoms which attend apoplexy.

There is a remarkable case of this description given by Dr Cheyne, in the 2d volume of the Dublin Hospital Reports, he prefaces the history of this case with the remark that doubts have been entertained of the conversion of the heart into fat, and that only one case as far as (p 396) he knew, have been published illustrative of that very curious morbid alteration.—In Dr Cheyne's case the patient died of apoplexy, which he supposes must have depended upon encreased action of the vessels of the head, as the heart itself was apparently incapable of communicating much impetus to the circulating mass.

The following case, in many particulars, and in its termination, resembled that above alluded to.

An officer in the revenue, aged 68 years, of a full habit of body, had for a long time been incapable of any exertion, as he was subject to oppression of his breathing and continued cough. In May 1819, in conjunction with his ordinary medical attendant, Mr Duggan, I saw this gentleman—he was just then recovering from the effects of an apoplectic attack, which had suddenly seized him three days before. He was well enough to be about his house, and even to go out. But he was oppressed by stupor, having a constant disposition to sleep, and still a very troublesome cough. What most attracted my attention was, the irregularity of his breathing, and remarkable slowness of the pulse, which generally ranged at the rate of 30 in a minute. Mr Duggan informed me that he had been in almost continual attendance on this gentleman for the last seven years, and that during that period he had seen him, he is quite certain, in not less than twenty (p 397) apoplectic attacks. Before each of them he was ob-

served, for a day or two, heavy and lethargic, with loss of memory. He would then fall down in a state of complete insensibility, and was on several occasions hurt by the fall. When they attacked him, his pulse would become even slower than usual, his breathing loudly stertorous. He was bled without loss of time, and the most active purgative medicines were exhibited. As a preventive measure, a large issue was inserted in the neck, and a spare regimen was directed for him. He recovered from these attacks without any paralysis. Oedema of the feet and ankles came on early in December, his cough became more urgent, and his breathing more oppressed, his faculties too became weaker.

November 4th, 1819, he was suddenly seized with an apoplectic attack, which in two hours carried him off, before the arrival of his medical attendant.

DISSECTION

56 hours after death

The dura mater presented a natural appearance. The arachnoid membrane was separated from the pia mater by a fluid of gelatinous appearance. The substance of the brain was watery and of a yellowish white colour. There was some water in the ventricles. These cavities did not appear enlarged, but the foramen (p. 398) of communication between them was dilated. The coats of the carotid and middle arteries of the dura mater were quite white and opaque from bony deposition, but were pervious.

The right lung was sound. The left was compressed, and adhered to the side of the thorax, about a pint of serum and quantities of soft fat, of a very deep yellow colour, filled up the space between the anterior mediastinum and the compressed lung, which was impervious to air, and must have been totally useless.

The right auricle of the heart was much dilated. The right ventricle externally presented no appearance whatever of muscular fibres. It seemed composed of fat through almost its whole substance, of the same deep yellow colour as that which occupied the place of the left lung. The reticulated lining of the ventricle, which here and there allowed the fat to appear between its fibres, alone presented any appearance of muscular structure.

The left ventricle was very thin, and its whole surface was covered with a layer of fat. Beneath this, the muscular structure was not a line in thickness, it had degenerated from its natural state, was soft, and easily torn, and a section of it exhibited more the appearance of liver than of a heart. The septum of the ventricles presented (p 399) the same appearance. In both ventricles, even in the lining fibres, yellow spots, where fat had occupied the place of muscular structure, were to be observed. The whole organ was remarkably light, the valves were all sound, except those of the aorta, which were studded with specks of bone, but elsewhere were cartilaginous and elastic, from which they derived a disposition to remain closed, a fluid gently injected from the ventricle would pass them, still, when the heart was reversed and water poured from the ventricle upon them, their valves retained it, its weight was not sufficient to separate the edges of the thickened valves. There was much fluid blood contained in the heart.

The liver was natural, the vena porta was unusually distended. The spleen was healthy in its structure, although enlarged, the other viscera presented nothing unusual.

In both these cases, No 1 and No 2, apoplexy must be considered less a disease in itself than symptomatic of one, the organic seat of which was in the heart, although during life there was much analogy in their symptoms, the examination of the bodies after death disclosed a state of the heart altogether different, in one the ventricle was found nearly an inch in thickness, while in the other, fat had so (p 400) accumulated at the expense of the muscular structure, that it was scarcely a line in depth. The explanation of the fact how causes so different could have produced effects nearly similar, will, I imagine, be found in the reflection, that anything occasioning an undue distention of the vessels of the brain, may be followed by apoplexy. This overdistension may arise from the impulse a tergo being preternaturally strong, or on the contrary, it may be the result of some obstruction in front, as that arising from a contracted arterial opening, or some state of the ventricle incapacitating it from emptying itself with sufficient quickness to relieve the brain.

Indeed, upon considering the latter condition of things, where the heart is slow in transmitting the blood it receives, we find, I imagine, even in this a means of accounting for the lethargy, loss of memory, and vertigo, which attends these cases. For the venous blood, which under such circumstances, is supposed to accumulate in the brain, is evidently ill-suited to the functions of this organ. Although the quality of the blood may thus be supposed to have some influence in producing these bad consequences, yet it is probable that the principal causes determining an apoplectic attack where the heart is either actively enlarged, or in a state of atrophy, are mechanical and referable to circumstances in the heart, directly or indirectly producing a state of congestion of the vascular system of the brain.

(p 401) OF RUPTURE OF THE HEART, ANEURISM, AND RUPTURE
OF THE CORDAE TENDINEAE

Sometimes the muscular substance of the heart, constituting the whole thickness of the ventricles, at a certain point gives way, and death instantaneously occurs, there are however cases on record wherein this event did not so immediately follow the rupture of the heart, in which it is supposed that the blood has quickly coagulated, and thereby effected such pressure on the lacerated aperture in the ventricle as for several hours to retard the fatal result.

From some cause not as yet sufficiently known, perhaps from some weakening or rupture in the muscular fibres of the heart, an aneurismal cavity is formed, which communicates with one of the ventricles, the walls of this cavity, however constructed, are partially projected into a tumour which is covered by the membranes of the heart, and has been found to contain within it laminated coagula as in arterial aneurisms. the tendency of this disease is to go on encreasing until the sac bursts, as in ordinary aneurism, when death immediately ensues.

By the proofs of the existence of such a state a complete analogy is established between this disease of the heart and aneurism, as it exists in the arteries, and the impropriety of the application (p 402) of the term aneurism of the heart, as used by many

authors to denote enlargement of the organ, is consequently evinced

Lastly, the *cordae tendineae* which connect the auriculo-ventricular valves to the walls of the ventricles are sometimes torn, and the accident is soon followed by a train of the most distressing symptoms, which art can but little alleviate, and which speedily terminate in death

RUPTURE OF THE HEART

For the following case I am indebted to Dr Cheyne, Physician General, I beg leave to give it in his own words

A gentlewoman, upwards of sixty years of age, of a corpulent habit of body, and confined bowels was, on the 8th of August 1825, attacked with pain in the epigastrium Fomentations and liniments were applied to the abdomen, and pills were taken containing blue pill and calomel On the morning of the 9th, the evacuation from her bowels, not being considered sufficient, a purgative draught, consisting of infusion and tincture of senna and Rochelle salts, was given, and a terebinthinate enema, and she was blooded No relief having been obtained, I was called to see her at 5 o'clock, and considering the pain to be seated in the gall duct, and probably to arise from the (p 403) obstructed passage of a gall stone, I prescribed an opiate, which however she never took, for I had scarcely left her house when she had a fit of vomiting attended with some straining, at the end of which she sighed once or twice, and expired

DISSECTION

There was an unusual quantity of fat under the skin The pericardium was distended with blood, partly fluid and partly coagulated The blood had escaped from a rupture, nearly an inch in length, on the anterior part of the left ventricle The muscular fibre of the heart was remarkably soft in its structure, so as to admit of being broken down between the finger and thumb The heart was unusually loaded with fat, the liver was irregular in its surface, and rather enlarged, the gall bladder was contracted, and contained three calculi, the largest of which was

lodged in the mouth of the cystic duct, and completely obstructed the passage of the cystic bile

RUPTURE OF THE HEART

Mr Colles, Professor of Anatomy and Surgery to the College of Surgeons, informs me of the case of a gentleman who had marked apoplectic symptoms, for which he was bled, and had an issue inserted in his arm, about a week afterwards, one morning while this gentleman was in the water closet, he suddenly fell down dead

(p 404)

DISSECTION

The contents of the cranium were sound, the pericardium was distended with blood, when this was removed, the whole surface of the heart was found coated with fat, on the anterior and upper part of the left ventricle there was a large bloody spot, immediately beneath which there was a laceration of the left ventricle, through which a large bougie could be readily passed, through this the blood had escaped, which accounted for the sudden death of this gentleman the substance of the organ was soft and flabby, there was no disease of its valves or vessels

The specimen is preserved in the Museum of the College of Surgeons

CASE OF ACTIVE ENLARGEMENT OF THE HEART WITH RUPTURE OF
THE CORDAE TENDINEAE OF THE MITRAL VALVE,
COMMUNICATED BY DR CHEYNE

In the beginning of September a musician, 34 years of age, of a very robust frame, sanguine temperament, and corpulent habit, being at Limerick, where he belonged to the orchestra, and leading a life of irregularity and intemperance, exposed to heats and colds, was seized with a most acute pain in the left side of the thorax, precisely in the region of the heart, at one time it was so acute as to render him nearly frantic, five or (p 405) six persons could scarcely hold him down in bed, he had a dry cough, his breathing was oppressed, from which oppression he had most relief when leaning forward inclined to the left side, in which position he

usually sat He recovered partially and went to Cork, the pain continuing in a degree, and with some *stuffing*, as he called it, and cough, towards the end of September, he went to Cove with the intention of returning by sea to Dublin He there lived on board a coasting vessel for a fortnight waiting in vain for a favourable wind, much exposed to cold, and daily becoming worse, at last, impatient of the delay, he walked back to Cork, to return on the Mail and it was after this walk that he first observed an oedematous swelling of his ancles, which gradually extended to his thighs

On the 12th October 1813, this poor man had been free from pain for several days The stroke of the heart was indistinct, tremulous, and appeared to extend over the whole of the left side of the chest, from above the clavicle to below the scrobiculus cordis, at no one part between these points was the stroke more distinct than at another His pulse was 148, unequal, irregular and indistinct, his complexion was of a leaden colour, his countenance bloated, his eye staring and wild His recollection was becoming indistinct, unable to lie down, he passed the night in his chair His appetite was not much impaired, but he was flatulent and costive, his tongue was furred, its edges (p 406) were livid His urine was scanty, high coloured and lateritious

A walk of not more than a few hundred yards wonderfully added to the disturbance of the vital functions While such an exertion increased the dyspnoea, it gave strength and distinctness to the stroke of the artery His abdomen was swelled, and evidently contained a fluid He died without a struggle on the night of the 15th of October

The following were the appearances on the dissection, which the Surgeon General, who had humanely visited this man, permitted me to attend On cutting through the cartilages of the ribs the fluid, which was in immense quantity, spouted up to some height—in the right cavity of the thorax there were several quarts of fluid There were no adhesions between the pleurae, the lungs were sound The pericardium contained a considerable quantity of fluid The heart was so large that it resembled the heart of a bullock, the parietes of the left ventricle were thick-

ened, its internal surface much inflamed, various irregular excrescences grew from the mitral valves and semilunar valves of the aorta, and the cordae tendineae, which connect the larger portion of the mitral valve to the walls of the left ventricle, were torn off just at the point of their insertion into the edge of the valve, at this point there were also some of the above mentioned excrescences, four of the broken cordae tendineae hung loose into the ventricle.

(p 407)

ANEURISM OF THE HEART

There is no disease more familiarly spoken of than aneurism of the heart, yet the affection, which is with propriety so denominated, is exceedingly rare Corvisart and Baillie have each seen but a single instance of it In Sir Astley Cooper's Lectures it is stated, that he has known three examples of this disease, one of the cases which he had an opportunity of seeing was that of a soldier who had suffered a severe flogging, and during the punishment he held his breath he shortly after complained of a violent pain in his chest, which was quickly followed by ascites and oedema of the inferior extremities He died suddenly, and on inspecting his body it was reported to him that an aneurism, which had been formed in the left ventricle, had burst into the cavity of the pleura on the left side

Partial dilatations of the left ventricle, as in Dr Baillie's case, are sometimes, though very rarely, met with Dr Cusack shewed me a specimen preserved in the museum in Park-street, in which the left ventricle is partially dilated into a pouch large enough to contain a walnut, there were no laminated coagula contained in it Of the history of the case nothing very particular could be collected, the man died suddenly A large quantity of water was found in the pericardium

The most perfect specimen of this disease that has come to my knowledge was met with by my friend Mr Harrison, Demonstrator of Anatomy to the Royal College of Surgeons, who has deposited the heart in the Museum of the College of Surgeons, and I subjoin, in Mr Harrison's own words, the history of this case, with an account of the dissection

CASE OF ANEURISM OF THE HEART

Jane Halfpenny, aet 39, was naturally of the sanguineous temperament, but her appearance had been altered by habits of profligacy and dissipation of the lowest description, her flesh was flabby, and her countenance was somewhat of a purple cast. This unfortunate woman was deaf and dumb, and seemed to have no friend in the world, consequently but a very imperfect account could be obtained of the history of her health previous to admission into the hospital, her pulse was full and quick, her tongue white, most of her distress seemed confined to the chest, her breathing was difficult, her lips livid, and she pointed to the region of her heart, when attempting to give an idea of her situation to her medical attendant. She was discharged in ten days from the hospital, having obtained great relief from medical treatment, rest, and confinement in a place where she was restricted from the use of spirituous liquors, to which she had been for the (p 409) last five years addicted. her treatment consisted in the application of a blister over the region of the heart, two large bleedings, and the daily exhibition of purgative medicines. On the 19th of July 1823, she was again admitted into hospital with all the symptoms formerly complained of, now greatly increased, the action of the heart was so violent as to be perceptible through the patient's dress. When the hand was applied over the region of the heart, she was reluctant to allow the least pressure to be made, as it seemed to give intolerable pain. the pulsations of the organ against the 5th and 6th intercostal spaces were unusually strong and distinct, her countenance was bloated, and of a livid hue, she was afflicted with paroxysms of difficult breathing, her feet and limbs were anasarcaous, her pulse was feeble, rapid and intermitting. she apparently underwent a temporary improvement for a day, from the good effects of bleeding, blistering, and small doses of the tartar emetic solution, but on the succeeding day she suddenly became restless, her countenance indicated great distress in the chest, she seemed each moment on the point of suffocation, and could only breathe when raised up and supported in bed, her extremities became cold, her pulse

weak, indistinct, too rapid to be counted, and on the following night, the 23d of July, she expired

(p 410)

DISSECTION

Of the body 36 hours after death

The thorax was well formed, in raising the sternum, I was struck with the unusual size of the pericardium, its opacity and great firmness, particularly towards the apex of the heart, where it was distended by a tumour of considerable magnitude, the internal surface of the left lung (which did not collapse when exposed, in consequence of a firm adhesion to the parietes of the thorax) was so intimately connected with the pericardium, that it was difficult to separate it, the phrenic nerve was imbedded in a quantity of adhesive matter, the result of inflammation, which connected the lung to the pericardium, and was thrown from its usual situation backwards and behind the apex of the heart, except for the adhesion above mentioned, the lungs were healthy. The pericardium was found unusually adherent to the heart, when it was removed from the anterior part of the heart, this organ being now more clearly exposed, was found to be thrown forward by a large round tumour of a very firm consistence, which was situated behind and below the apex of the heart, this tumour was nearly as large as the heart itself, and much more firm to the touch, it was inseparably attached to the left ventricle, and to the pericardium, in some parts it was as firm as bone, and small patches of calcareous matter could be felt in different (p 411) situations. Inferiorly the tumour rested on, and was closely attached to, the central tendon of the diaphragm, anteriorly it was intimately connected with the pleura, the cartilages of the 5th, 6th and 7th ribs, and the intervening muscles, this latter connexion required to be cautiously dissected through, as the sac was here very thin, though as hard as bone. Upon making a small incision into the tumour posteriorly, I found that the sac was very thin, and similar to that of an old arterial aneurism, it was lined with a stratum of chalky or calcareous substance, which in some spots was so firm as to resist the knife, the sac in

this situation was about the thickness of a wafer, and appeared to be formed solely of the condensed and altered pericardium, elsewhere the sac was found much thicker, and appeared to have been formed not only by the pericardium, but also by the fleshy substance, and lining membrane of the heart, in some places the fleshy fibres, after a short course, became so condensed and pale as to lose all appearance of muscle, in all other situations the pericardium and lining membrane of the heart were closely connected, except where, in a few small patches, some earthy depositions intervened, at the lowest part of the tumour the sac appeared to be formed solely of the thickened pericardium

From this examination I was disposed to infer that the aneurismal sac had been formed in the first instance by a dilatation of the three structures, (p 412) viz the pericardium, the muscular substance, and the lining membrane of the ventricle, but that, as the tumour increased in size, the lining membrane and muscular substance were absorbed, so that the pericardium alone remained to circumscribe the disease and to confine the blood within the cavity, which purposes had been accomplished by the process of interstitial growth which nature had actively excited, thereby rendering this membrane so extraordinarily dense and strong that it was enabled to resist (probably for a long period) the action of the heart itself

The sac was filled with a firm coagulated mass of a greyish colour and of a laminated texture, like the ordinary coagula in arterial aneurism I next examined the cavities of the heart, and found nothing unusual in the right or left auricle, or in the auriculo-ventricular valves the right ventricle was healthy, as also the valves of the pulmonary artery and aorta Having divided the anterior part of the left ventricle, I remarked the lining membrane of this cavity to be unusually dense and white, its muscular structure was natural, perhaps it was somewhat increased in thickness at the inferior part of this cavity, that is, near the apex of the heart, I observed a circular clot of blood about the size of a half crown, this clot filled the mouth of the aneurism, and appeared to have been recently coagulated, its surface was cupped and not very firm, its circular edge, which was well de-

finer, was nearly in (p 413) apposition with, and did not adhere to the edge of the opening on making a section of the tumour anteriorly, I discovered that a considerable portion of the parietes of the sac had been formed by a dilatation of the muscular substance of the heart. At the upper part of the tumour the lining membrane was peculiarly firm, and the muscular coat very distinct lower down, the latter became condensed, and was converted into a cartilaginous substance with bony plates dispersed through it, and still lower, the sac was formed merely of the condensed pericardium, lined with some calcareous matter this part of the sac was in very intimate adhesion with the parietes of the chest, and from the extent to which the process of interstitial absorption had been carried, there can be no doubt but a short period would have brought it to the surface as in the 5th and 6th intercostal spaces, the tumour was only covered by the integuments and by the intercostal muscles, which had become pale and thin. On examining the cut edges of the coagulated mass which filled the tumour, the whole appeared to be formed of successive layers of coagulated blood, those farthest from the heart were pale and firm, while those nearer the cavity of the ventricle being more recently formed, were softer and of a redder colour. In the abdomen no morbid appearances were observable, the urinary bladder was distended with clear urine, the uterus appeared healthy, the right ovary (p 414) was distended into a sac filled with about four ounces of albuminous fluid.

On examining the contents of the cranium, I observed the arachnoid or serous membrane of the brain, on the upper surface of each hemisphere, particularly near the longitudinal sinus, to be more dense and white than natural, also a slight gelatinous effusion beneath it no other morbid appearance was observable in the membrane of the brain, and the structure of that organ itself appeared perfectly healthy.

III—OF ORGANIC CHANGES AFFECTING THE ARTERIAL AND AURICULAR OPENINGS OF THE VENTRICLES

The arterial and auricular openings of the ventricles are liable to contractions, which are invariably combined with some carti-

laginous or osseous depositions Such alterations in the structure of the heart disturb the circulation in a very remarkable manner, and produces great derangement in the functions of almost every organ in the body It has been remarked by Bichat, that the right side of the heart is never to be found the seat of the cartilaginous or earthy depositions in which these contractions originate, but subsequent observers have seen the valves of the pulmonary artery, and the tricuspidal valves also, encrusted with bone In my own experience, some instances have occurred, in which the tricuspidal valve was beset with bony specks, and I have known the pulmonary artery to be similarly affected, but I have never found the right auriculo-ventricular aperture, the seat of that peculiar organic change which is so often to be met with at the left side of the heart, and I am therefore inclined to believe it to be exceedingly rare, on the contrary, the organic disease which consists in a narrowing of the left auriculo-ventricular aperture, I have reason to believe, is much more frequent than is generally supposed, a conclusion I have come to from the number of such cases I have met within a few years

This is a disease which, according to my observation, shews itself at all periods of life occurring in the young as well as the old, and unlike other diseases of the heart and vascular system, it manifests itself as frequently in the female as the male The signs of this complaint in its first stage are so vague and equivocal, that they are usually set down as nervous symptoms, unfortunately the prognosis is generally unguarded, and a line of treatment calculated to aggravate rather than relieve the organic disease, is prescribed

We seldom have an opportunity of ascertaining the actual state of the auriculo-ventricular opening in the early stage of this disease, as death (p 416) rarely occurs until the person is worn out by a long train of suffering, and the aperture of communication between the left auricle and ventricle is converted into a mere fissure, I have however known two instances in which the patients were suddenly carried off early in this disease, the one by apoplexy, the other by epilepsy, which were evidently the

consequence of the difficult transmission of blood through the left side of the heart, by which, the functions of the brain were so disturbed that these fatal effects were produced

I shall briefly give the history of these two cases

NO 1 —CASE OF CONTRACTION OF THE LEFT
AURICULO-VENTRICULAR OPENING

I was requested to examine the body of a lady aged 45, who had died suddenly in an apoplectic fit, as reported to me. The body was remarkably fat. In the brain there was no effusion of the blood or water in the ventricles, nor in fact was there any thing different from the natural state observable, except that the arachnoid membrane was slightly raised from the cerebral convolutions by a turbid serous effusion, nothing however, was remarked sufficient to denote an apoplectic death, which was the more carefully sought for, as it was expected we should find in the brain appearances to account for the fatal termination.

The lungs were natural, there was much fat (p 417) in the mediastinum. The heart appeared remarkably short and was rounded towards its apex, in the interior of the organ every thing was natural except the mitral valve, which as yet, was not beset with earthy concretions, but was shortened to more than half its natural depth. It was yellow, opaque, and at the same time thickened as if a cartilaginous substance had been deposited between its laminae, the aperture which the edges of this valve circumscribed was sufficiently open to allow the blood a free passage from the auricle into the ventricle, but it was manifestly incompetent to perform the full office of a valve, or prevent a regurgitation of blood into the auricle during the contractions of the ventricle.

Such a state of the heart accounted for many ill-defined sensations about the precordial region, which were called nervous, of which this lady had habitually complained for nearly a year before her sudden dissolution. She had occasional oppression of breathing, palpitation of the heart, with a small pulse, but the symptom of moment (from which some warning of what did so unexpectedly occur might perhaps have been taken) was, that

while her countenance did not wear the least sign of indisposition, and while she had every external appearance of health, her pulse was weak, small, and never to be felt beating less than 120 in a minute. Although this state of the pulse was habitual, there was no other symptom of pyrexia present, the body (p 418) was rather disposed to fatness and plethora than to wasting, the spirits, rest, and appetite good, and the countenance did not betray the least sign of indisposition, but the constant palpitation of the heart, the quickness of the breathing whenever the least exertion was made, and vertigo, were most distressing, and gave the lady apprehensions about herself that others did not feel, but which the sudden result justified.

NO II — CASE OF CONTRACTION OF THE LEFT
AURICULO-VENTRICULAR OPENING

Anne Conroy, aged 45 years, accompanied by Mr Michael Moore, one of my class pupils, called at my house in June 1824, this woman had been a cook, and was then in service, she had enjoyed tolerable health until within the last year, she complained now of a sensation of weight in her right side, of palpitation, uneasiness and weakness about her heart, of occasional severe cough, always accompanied by a frothy expectoration. She particularly mentioned that the tone of her voice was constantly varying, sometimes so hoarse she could scarcely be heard, and again it would become shrill, her breathing was perfectly natural while she was speaking to me, but I learned from her that she had occasional paroxysms of dyspnoea, yet with such symptoms she had not the appearance of an invalid in her countenance, except that her complexion had too much of a livid hue. She felt herself capable (p 419) of going through her ordinary business, her appetite was good, and she was rather disposed to be fat, her rest at night was perfect, indeed she complained of having an inclination to sleep too much.

The symptoms which most distressed her were palpitation of the heart and vertigo, with which last was generally associated the awful idea that she was about to fall down dead. Upon

laying my hand over the precordial region, I discovered that the action of the heart, as to force and frequency, was indeed extraordinary, whilst the pulse, felt at the wrist, was a mere thready stream, unequal and irregular, beating at the rate of 150 in a minute. There was not as yet the slightest disposition to oedema. There was no deformity of the thorax observable.

From the irregularity and want of correspondence between the force of the pulse of the heart, and that of the artery at the wrist, it seemed probable, that these symptoms depended on some organic affection of the valves of the heart, which deranged *mechanically* the circulation of the blood, this suspicion was increased upon considering, that the quickness of the heart's action could not be *sympathetic* with any disease elsewhere in the system, as none such was observable, the prognosis therefore was unfavourable.

I advised her to be bled from the arm, that her (p. 420) diet should be strictly vegetable, that she should take the tincture of digitalis in small doses, and above all things give up her laborious occupation. None of these directions was followed. I apprehended, from the severity of the symptoms, that she would be suddenly carried off in an apoplectic fit, and having announced my opinion to her master, I begged to be informed of it, should such an event occur.

On the second of July, 26 4 o'clock in the morning, I was called upon by my pupil Mr. Adam Fuller to visit this poor woman, she had taken a fit in her sleep. I was surprised on my arrival not to find her in a fit of apoplexy, but seized with a regular epileptic paroxysm. Instead of all or one of her limbs being flaccid and paralyzed, she lay extended in a state of universal convulsion, her limbs were inflexible, her countenance was turgid and livid, and she forced a whitish foam from her mouth. her pulse was small, frequent, and irregular, as to force and frequency it was constantly vacillating.

I hastened to relieve the brain, which I judged to be oppressed, by abstracting about ten ounces of blood. I ordered a purgative

and a foetid enema, but the same continued convulsion did not alter its character for a moment, and she expired at eleven o'clock

(p 421) DISSECTION *performed on the third of July*

In the brain no ruptured vessel was discovered, but the general venous congestion was remarkable. There was a slight opacity of the arachnoid membrane. There was some water in the right side of the chest. The heart was of a peculiar form, owing to the greater capacity of the right side than the left. The pulmonary artery was unusually dilated, the aorta contracted, the left ventricle was diminished in size, the auricle a little dilated, the mitral valve was not half its ordinary depth, its borders were shrivelled and puckered up as if a thread were drawn through them, and contained some spiculae of bone, it was manifestly incompetent to do more than half guard the aperture of communication between the auricle and ventricle, this aperture was contracted, but was still large enough to admit easily the extremity of the index finger to the first joint, and it must have permitted the blood to pass without much difficulty from the auricle into the ventricle. In consequence of the shortening of the valve, it imperfectly covered the auriculo-ventricular opening, and too readily allowed of a reflux of blood into the left auricle during the contraction of the ventricle, hence the effort of the heart, instead of being as it is in the natural state, expended in propelling onwards the blood through the aorta, was partly lost, because of the imperfect state of the valve admitting a regurgitation of some (p 422) of the blood which was destined to pass into the aorta, the heart was therefore obliged to reiterate its beats, to compensate by its quickness for that small quantity of blood it was capable of forwarding at one contraction through the aorta. In this organic change of the valvular apparatus at the left side of the heart, by which a return of blood from the brain and lungs was impeded, we find the source of the quickness of the pulse, the vertigo, the dyspnoea and the sudden termination of these cases. In both we find the mitral valve and auriculo-ventricular opening in a state nearly similar, although the effects of this organic

change were so dissimilar, the one having died of apoplexy, the other in an epileptic fit it would not be easy to assign any reason for these differences, nor to explain why the cases terminated so speedily. They are useful however in showing, that even in the first stage of this disease, life is very insecure, and the dissections present us with what we have not often an opportunity of seeing, namely, the change of the mitral valve which takes place when this disease is in, what may be termed, its first stage.

When the disease is fully established, the signs of the contraction of the left auriculo-ventricular opening are by no means doubtful. The person affected with it has the general symptoms of diseased heart, there are paroxysms of dyspnoea haemoptysis, much uneasiness also is experienced in lying in any but one position, sometimes (p. 423) the patient can only lie with ease on the right side, he more commonly prefers the left, but the cause of these varieties I am unable to explain. The palpitations of the heart are irregular, widely extended, they are seen underneath the lower extremity of the sternum, and the heart beats with considerable force against the side of the chest. As the disease advances, all the above mentioned symptoms are aggravated, the limbs become anasarcaous, and the abdomen fills with water. Towards the latter period of the disease I have seen jaundice set in, and in so many cases that I cannot look upon it as an accidental circumstance, but rather as a symptom occasionally to be found attending the very last stage of this disease. Strong pulsations are seen in the jugular veins, and there appears a general thrill through the branches of the arterial system as in aneurisms, when the ear is attentively applied to the side of the thorax, a very complex kind of movement, hard to describe, is heard,—a hissing purring noise as it has been denominated, caused by the transmission of blood through a narrow orifice, is in most cases very evident. The more decided symptoms of this affection are to be found in the peculiar irregularity and want of correspondence in the pulse, as felt at the wrist, and examined simultaneously at the heart, the latter often beats so violently against the sides of the thorax as to shake the patient in his bed, while at the same

time the arterial pulse is small, weak, and irregular, indeed such is the state of the pulse in the arteries, that the physician attending (p 424) to this only, and overlooking the state of the heart, might readily suppose his patient in the last extremity, and dread to have recourse to those remedies from which alone any relief is to be expected

This irregularity, want of correspondence, and disproportion between the force of the beat of the heart and the pulse as felt at the wrist, are not the only circumstances worthy of our attention, for such a set of symptoms are common to the contraction of the auriculo-ventricular opening, and the narrowing of the aortic aperture, but the pathognomonic sign of the former disease will be found in this, that the heart will sometimes give two, three, or even four beats in succession, which are not perceptible to the hand examining the pulse in the arteries, the pulse at the wrist is very peculiar, and a knowledge of its character will assist us much in forming our diagnosis I know not how to describe it otherwise than by saying, that it appears to the person examining it as if there were two pulses, one slow and deliberate for two or three beats, which is succeeded by three or four rapid and indistinct pulsations, the heart upon the whole generally pulsates ten or fifteen times more in a minute than the artery, and its stroke is often more distinct in one arm than another

The length of time a patient may be afflicted with this disease will be found to be very various, it is, generally speaking, slow in its (p 425) progress, and its severity can be greatly mitigated by proper medical treatment, if the patient can submit to confinement, rest, and a strict vegetable regimen, even after the dropsical symptoms have shewn themselves, he may live for a number of years it is surprising to what a small fissure the left auriculo-ventricular aperture may be reduced before death supervenes I may here remark that the dropsy, which, without exception, I have found to attend on the last stage of this disease, seems to me to be much more tractable than the same symptom when it shews itself towards the close of any organic affection of the liver or lungs

NO III—CASE OF CONTRACTION OF THE LEFT
AURICULO-VENTRICULAR APERTURE

Three years ago I was consulted by Jane Gibson a poor shop-keeper, living No 15, Fisher's Lane, she had great difficulty in breathing, and constant palpitation of the heart, head-ache and vertigo, the limbs were anasaralous and much distended, and the abdomen evidently contained water, there was a deficient secretion of urine, the countenance was natural, except at times when the breathing and palpitation were unusually distressing, there was little or no cough, but the slightest mental agitation or exercise of the body, as that even of walking a few streets, would aggravate all her symptoms, in bed she could only rest upon her right side, and she preserved, most of the day, the sitting posture this woman had been (p 426) for the last year much in this condition, having had, all her life previously, excellent health, nor could she assign any satisfactory cause for the origin of her complaint

I found, upon exposing her chest, that it was well formed, the action of the heart was rapid, strong, and irregular, while the pulse at the wrist was weak and thready, and although its beat was for the most part synchronous with that of the heart, there were often two, three, or even four pulsations of the heart, at a moment when all pulsation was suspended in the arteries, and could not be felt by the finger placed accurately over the radial artery the pulse counted here, ranged at the rate of about 120 in a minute, and the beats of the heart, during the same time, exceeded by ten, twelve, or fifteen, that number I have never seen the pulsations in the jugular veins more evident than in this case, and I ascertained that their beats corresponded accurately with every pulse of the heart, even with those which were not felt in the arteries, moreover when pressure was made on the external jugular veins, two or three inches above the clavicles, the veins became distended beneath this point during their pulsations, even more than when the pressure was omitted

Having seen such an exact combination of symptoms as this in many cases which terminated fatally, and ascertained by an

examination after death that their source was to be found in (p 427) the narrowing of the aperture of communication between the left auricle and ventricle, I have little doubt as to the real nature of this case. This woman is still alive, and in conjunction with my friend Dr M'Donnell, I this day visited her, and found her nearly in a similar state to that I have above related, save that her dropsical symptoms are less pressing, in consequence of her daily use of diuretic medicine. She has been strictly attentive to her regimen, and has confined herself almost exclusively to vegetables. Fortunately it has been her lot to be in a condition of life suitable to her complaint, she has now no anxiety, and her business seldom puts her to the necessity of leaving the sitting posture, the only one in which she can obtain any relief from that source of continual annoyance, the palpitation of the heart, which, whenever it becomes urgent, to use her own words, "takes away her breath." Some time ago, in conjunction with Mr Wilmot and others, I attended a lady aged 60, who laboured under a similar train of symptoms, in whom also the pulsations in the jugular veins were very remarkable. After a year and a half of severe suffering she died dropsical, and, upon examination of the body, the source of her symptoms was found in the narrowing of the aperture of communication between the left auricle and ventricle, the edges of the mitral valve being puckered up, and a fissure of a semilunar form about half an inch in length, the edges of which were beset with bony specks, being the only space which permitted (p 428) the blood to pass from the auricle to the ventricle. The left auricle was largely dilated, while the corresponding ventricle was diminished, the right side of the heart was actively enlarged, or in a state of hypertrophy, and the pulmonary artery and aorta were in size proportioned to the ventricles from which they respectively arose, in short, the heart had acquired the usual form it, after a time, assumes when this organic alteration in the mitral valve has been fully established. I shall not detain the reader by an unnecessary detail of cases of this too common disease, but will content myself with mentioning one out of a great many which I have met with.

NO 11.—CONTRACTION OF THE LEFT AURICULO-VENTRICULAR OPENING

Dr William Hamilton, now Surgeon of the Wicklow Infirmary, attended with me a youth aged 15 years. He was, we were informed, delicate from his infancy, liable to breathlessness, cough, and palpitation of the heart, from the slightest causes. He was incapable of engaging in the amusements natural to children of his age, his symptoms, however, never confined him wholly to the house, until within the last year of his life. His urine became scanty and high coloured, all his symptoms grew worse, his limbs became anasarous, and he was visited, every evening, with a paroxysm of difficult breathing.

(p. 429) When I saw him, which was about six weeks before his death, I found him in the following state: his countenance shewed the distress and difficulty of breathing under which he laboured, the eyelids were swollen with a watery effusion, his inferior limbs were anasarous; there was an unusual prominence of the left side of the sternum to be observed; the pulsations of the heart extended themselves widely over the thorax, and at a distance could be heard beating with considerable force against his breast. That this organ performed some kind of complex double movement, and that its motions were accompanied with a purring sound, as in varicose aneurisms, was plainly audible, and could be also recognized when the hand was placed over the region of the heart, the pulse at the wrist was very weak and irregular, sometimes very obscure, and always manifestly disproportioned to the powerful action of the heart. There was often a double pulse at the heart for a single beat in the arteries, pulsations were also seen in the veins of the neck. Upon a careful consideration of all the symptoms, I concluded that the contraction of the left auriculo-ventricular aperture, if not congenital in this case, had been for a long time completely established, the prognosis given was unfavourable, all that remained to be done was to palliate symptoms as they occurred. The dropsical swellings were often evacuated by the administration of diuretic medicines, and the breathlessness was repeatedly (p. 430) relieved by venesection.

But these palliatives, after a time, ceased to be of use the effusion became general, and the dyspnoea which used to occur in paroxysms only, now became habitual. he was incapable of assuming an horizontal posture From this miserable state he was relieved on the 12th July 1824 He suddenly became jaundiced, in three days afterwards he died in a subapoplectic state

DISSECTION

Assisted by my friend Dr Hamilton, I examined the body 24 hours after death The whole surface was of a deep yellow colour, limbs oedematous, the abdominal organs were sound, the liver was of a livid colour, greatly gorged with blood, yet its ducts were pervious, and there was an abundant quantity of bile in the intestines, the lungs were perfectly sound, there was about a pint of yellow serum in the cavity of each pleura, the cartilages of the ribs, cellular membrane, in fact, every tissue were dyed yellow, the pericardium contained a small quantity of serum, there was no adhesion of this membrane to the organ

The heart presented an unnatural appearance, yet had a form similar to what I have in other instances observed impressed on it, in consequence of a permanent contraction of the left auriculo-ventricular aperture, the auricles were (p 431) greatly dilated, the right ventricle seemed unusually convex and enlarged, it having equally contributed with the left, as in the foetus, to form the apex of the heart the latter was rounded off in this direction, and the whole organ presented more of a circular or oval form than it naturally does The increased capaciousness of the right side over the left was so remarkable, that the latter was entirely concealed behind the former

The right ventricle in fact presented much the appearance which the left does when enlarged, so rounded and convex did it appear This no doubt was partly owing to a great accumulation of blood in its cavity, but in part it arose from a dilatation and increase of substance of the parietes of this side of the heart

The left ventricle, as it was so much diminished, was not near so long as the right, which terminated in a rounded pouch-like extremity, not at all resembling the natural apex of the heart,

which in a well formed adult heart, the left ventricle chiefly constitutes. The two large arteries were in exact proportion to the ventricles from which they respectively arose. The pulmonary trunk was dilated nearly to twice its natural size, the aorta was diminished to about half its ordinary calibre. In the interior of the organ nothing was remarkable at the right side but an unusual prominence of the carnaeae columnae, the valves here were all perfectly sound.

(p. 432) The left auricle was largely dilated, and contained a quantity of grumous blood. the left ventricle was of its natural thickness, but shortened and diminished a little in capacity. The communication between these was greatly interrupted, not by any contraction resulting from bony depositions, or by narrowing from any cause commencing in the zona annularis of the ventricle, but it appeared as if the contiguous edges of the left auriculo-ventricular valves had, as it were, coalesced (or had never been separated), and thus was formed a transverse septum, constituting at once a floor to the auricle, and roof to the ventricle,—concave towards the former, convex towards the latter, perforated by an oblong opening, bearing in its appearance some resemblance to the rima of the larynx. There was not to be discovered in the valves a speck of bony or earthy deposition. A few yellow cartilaginous excrescences, preparatory to such a state, alone occupied the broadest extremity of the narrow opening.

As the appearances which the heart in the dissection of the foregoing case exhibited, resembled so much what I have observed to be constantly the state of the organ in those who have died in the advanced stage of this disease, I have but very few additional observations to make upon this subject. The appearance however of the contracted opening of communication between the left auricle and ventricle deserves a moment's (p. 433) attention as in the organic change, I believe, is to be found the immediate mechanical cause of the new form which the heart acquires, and of all the symptoms which characterise this peculiar affection. When the dilated auricle is cut into and cleared of the blood it contains at its lowest part, instead of the mitral valve, a concave transverse septum of a yellow colour is seen, which is perforated

by an oblong fissure, about half an inch in length, and one or two lines broad, this fissure I have observed to be always obliquely situated, and to run parallel to the septum of the ventricles, it generally is of a semilunar form, the concavity of the curve looking towards the root of the aorta, the convexity backwards, the first formed by the larger portion of the mitral valve, the latter by the smaller, the edges of this oblong fissure are generally studded with bony depositions, viewed from the left ventricle the membranous septum is convex, and the angles of the fissure are connected by shortened chordae tendineae, with two very thick fleshy columns, the one in front, the other behind, this I think it necessary to mention, as, from the enlargement of these carneae columnae, it is manifest that they must have had to exert some inordinate effort to make the imperfect valve capable of acting its very important part in the mechanism of the circulation

The cavities of the heart I have in general found filled with coagulated blood, which in some (p 434) cases I have seen assume the appearance of the polypiform concretions, which so much attracted the attention of the older pathologists most of these coagula had the appearance of recent formation, but my friend Mr McDowell last winter found in the left auricle of a subject who died of the disease we are now considering, a ball as large as a pigeon's egg, it was formed of the fibrine of the blood, was very firm in its consistence, and of a figure perfectly spherical, except that there was an oblong depression on it, which corresponded accurately to the form of the edges of the fissure by which the left auricle and ventricle communicated, small fossae also, which must have been produced by the frequent contact of the bony spiculae, were seen upon its surface, from all which it was manifest it could not have been of recent formation we examined this curious specimen of polypiform concretion too accurately to be deceived upon these points, and this, and the heart in which it was found we have preserved Although the history of this case was not entirely unknown, nothing sufficiently precise could be elicited to authorise me in giving a summary of the symptoms, the prognosis formed, or the treatment which was adopted This example of contraction of the left auriculo-ventricular opening

serve to shew what struggles the heart will make, under the most unfavourable circumstances, to support life

Let us now consider how far the new form the (p 435) heart has acquired will enable us to account for the peculiar symptoms which attend this disease, among the most remarkable is, first, the want of correspondence between the force of the heart and strength of the arterial pulse, secondly, the irregularity of the latter, and occasional double beat of the heart for the single pulsation in the artery

First, when we recollect that the right ventricle is actively enlarged, and at the same time pushed forwards towards the sternum by the dilated auricles above and behind it, and moreover, that these three cavities just mentioned have a resistance to overcome at the left auriculo-ventricular aperture, we have no reason to be surprised at the vigorous pulse of the heart, to which the diminished left ventricle can contribute but little, as it is placed so much behind its usual situation secondly, the pulse in the arteries is small, weak, and irregular, and less frequent than that of the heart, because the pulse of the former is the indication of the state of the left ventricle, which, as has been already mentioned, is reduced in size, and we can account for the irregularity of the pulse in the arteries when we bring to mind that the left ventricle derives from the auricle above it a very precarious supply of blood, which is probably often inadequate to fill its cavity, under such circumstances, the left ventricle may contract in unison with the right, but the stream it has to transmit will not be sufficient to distend the (p 436) arteries, or make their pulsations sensible, at such a moment there is a total failure of the arterial pulse, while that of the heart (caused by the action of the right ventricle) is strong and vigorous, hence the phenomenon characteristic of this disease, the occasional double pulse of the heart for the single pulse in the arteries

This opinion is, I am aware at variance with that which refers the double pulse to the contraction, first, of the auricle, and next of the ventricle but as far as I have seen, the double pulse never occurs with the regularity which such an explanation would suppose to be so, it has always appeared to me difficult to con-

ceive how the pulsations of the left auricle could be felt by the hand placed on the breast, as that cavity is situated so close to the spine, and so far from the surface

Lastly, the pulsations seen in the jugular veins demand our consideration the cause of this symptom has been so much disputed, to me it appears most probable that it results from the regurgitation of blood from the right ventricle into the auricle, by which the current descending from the jugular veins is repelled back into these vessels during the systole of the ventricle The pulsations in the jugular veins I have always observed to be synchronous with the action of the heart, even with the pulsations which were not perceptible in the arteries

Mr Hunter, in his Treatise on the Blood, has remarked that the valves of the right side of the heart did not so completely close the arterial and auricular openings as those of the left, but this circumstance, in my opinion, has not been sufficiently noticed, nor the influence that such a structure may have on the circulation in its natural or morbid state considered I look upon this difference in the valves of the right and left side of the heart to be a natural provision to allow of a partial reflux into the right auricle, on those occasions when from any cause the passage of the blood through the arterial opening is retarded Such a provision was absolutely necessary in the right or pulmonary ventricle, as various natural causes must momentarily retard the passage of blood through the lungs—Let us suppose the right ventricle to contract vigorously at such a crisis—Some part of the valvular apparatus (which is not very strong at this side) or the ventricle itself might give way, were there not some other course for the blood than through the pulmonary artery in the natural state of the heart it is probable that there is constantly some little reflux into the right auricle during the contraction of its corresponding ventricle, as the valves readily admit it, but the great swelling of the jugular veins is only seen when extraordinary efforts are made, or when, from any enlargement of the right side of the heart, it is capable of containing a larger quantity of blood than it can readily transmit through the lungs, or the left receive, (p 438) on these occasions it is that the pulsations in the jugular

veins become evident, they are synchronous with the action of the heart, and can more readily take place when the right ventricle has been preternaturally dilated, as it is not likely that the valve will increase in size and breadth in proportion as the auriculo-ventricular aperture enlarges.

Upon the whole, therefore, I would conclude that the pulsations in the jugular veins, viewed as a symptom of the disease we have been just considering, depend upon this, that the right ventricle, unable to transmit all the blood which distends it, through the pulmonary artery, part of it must regurgitate towards the auricle and displace a column of blood descending into this cavity from the jugular veins, causing thus a momentary reflux or pulse in the veins nearest the right auricle. Such observations, however, are not meant to apply to, or explain venous pulsations in general, but merely comprehend those which I have witnessed in cases where the left auriculo-ventricular aperture was contracted. In all cases, however, in which evident pulsations are seen in distant branches of the venous system, I think it would be highly satisfactory that the relative proportion between the auriculo-ventricular aperture and the valve designed to cover it, should be accurately examined when opportunities occur of inspecting the bodies after death, and that more than ordinary care (p. 439) should be taken to discover whether any permanent obstruction had existed in any portion of the pulmonary circulation.

Before I conclude these observations on the healthy and deranged action of the auriculo-ventricular valves, I may remark that the mitral valve so perfectly closes the aperture of communication between the left auricle and ventricle, that, in the natural state, no reflux whatever is admitted, this, so useful at the right side of the heart, would have been not only useless, but injurious at the left side of the organ, as we find the general arterial system at all times equally ready to receive the blood during the systole of the left ventricle, and if the mitral valve did not perfectly close the left auriculo-ventricular aperture, a great deal of the force of the left ventricle would be wasted, whereby it would be incapable of moving the mass of blood which was destined to fill the arterial system. Pathologists in looking to the different

nature of the lining membrane at the two sides of the heart, as a means of explaining the greater liability of the left side to disease, have perhaps too much overlooked this circumstance, that while, from the unyielding nature of the mitral valve, all reflux into the auricle is prevented, from this very cause, which renders it effective in the circulation, is it exposed to more frequent injury from which organic disease may arise and the ventricle to which it belongs become more liable to be ruptured by its own efforts (p 440) However we attempt to account for it, the fact is undeniable that rupture of the right side of the heart, and injuries and diseases of the tricuspidal valve are as rarely as such accidents and lesions of the left side of the organ are frequently to be met with I shall conclude the observations I had to make on the morbid contraction of the left auriculo-ventricular opening, by considering how far this obstruction in the heart can account for some of the other symptoms of that disease

The brain, the lungs, and the liver, more or less, feel the injurious effects of this obstruction to the free circulation of the blood through the left side of the heart, the former is oppressed by an undue quantity of blood, the quality of which is ill suited to the function of the organ, hence the vertigo, and sometimes the sudden termination by apoplexy or epilepsy already alluded to The lungs and the liver are better able to accommodate themselves to this local plethora, but their functions are more or less disturbed Hence the dyspnoea, haemoptysis, deranged digestion and jaundice, which I have remarked in many instances Lastly, the general capillary system suffers from a double cause, the circulation of blood through these vessels must be languid, because the impulse a tergo which they can derive only from the left ventricle is weak, while there are numerous obstructions in front, but all arising from the one cause, namely, the (p 441) contraction of the left auriculo-ventricular aperture These vessels are probably relieved of their plethora through the exhalants, which open on the cellular membrane and serous surfaces, hence the anasarca first, the ascites and hydrothorax last, the constant attendants on the final stages of this disease

ON OSSIFICATION OF THE AORTIC VALVES, AND CONTRACTION OF
THE ARTERIAL OPENING OF THE LEFT VENTRICLE

There appears to be no disease of the heart or its vessels more generally to be met with than ossification of the valves of the aorta, this organic alteration is the cause of an obstruction to the free passage of blood through the arterial opening of the left ventricle, from whence, in most cases, remarkable symptoms arise. Some writers consider this change of structure to be so common in the old subject, that they look upon it less as a disease than as the natural consequence of age. When an ossified condition of the aortic valves occurs gradually at an advanced period of life, it is wonderful what little disturbance in the system at large is produced, when on the contrary it appears in the young, which is not very common, or about the middle period of life, it is in such patients attended with well marked symptoms. There are strong palpitations of the heart, and dyspnoea complained of, which are much increased by the slightest exertion, in a word, the ordinary signs of active enlargement of the left ventricle are present, except that the force of the arterial pulse is not proportioned to the action of the heart. It is irregular, and its contractions are accompanied with an hissing or purring sound, which can be clearly heard when the ear is applied to the side of the thorax, and a peculiar thrill is felt as in varicose aneurism, when the hand is laid on the praecordial region. With such a combination of symptoms this disease may be readily confounded with that which consists in a contraction of the left auriculo-ventricular opening, which we have just been considering. It is said, however, that the diagnosis will be found in this circumstance, that in the latter disease there is generally a double pulse to be felt at the heart for the single pulsation in the artery.

In the cases I have witnessed, in which calcareous depositions were discovered after death in the aortic valves, there had never been venous pulsation observed. The pulse had been weak and intermittent, but it presented neither the quickness nor peculiar irregularity which was constantly remarked in those cases in which, on dissection, the mitral valve was discovered to have

been the seat of the organic change before described. When the heart has been examined in those who have died of the disease, which consists in a contraction of the arterial opening of the left ventricle, this cavity has been found to be actively (p 443) enlarged, or in a state of hypertrophy, and to exceed in length the neighbouring ventricle, so that the whole organ seemed elongated, and the apex formed exclusively by the left ventricle was remarkably pointed, and of a contorted form, which is strongly contrasted with the shape the heart after a time acquires in consequence of a contraction having existed at the left auriculo-ventricular opening.

Such are the symptoms which generally attend a contraction of the aortal opening of the left ventricle, and the appearances which I have observed the heart to present in those who have died of this organic affection. The Profession is already acquainted with the ordinary forms of this disease, which it therefore becomes unnecessary to exemplify by cases, but I believe the following instance of ossification of the aortic valves and coronary arteries was attended with some remarkable peculiarities which render it worth noticing.

CASE OF COMPLETE OSSIFICATION OF THE CORONARY ARTERIES OF THE HEART AND OF THE AORTIC VALVES

A gentleman, aetat 68, of a pallid countenance, yet full and corpulent, while exerting himself in arranging some books on a high shelf in a library, suddenly felt severe pain in his chest, extending down his right arm, accompanied by a sensation of numbness. His sight became dim, he had (p 444) vertigo but did not fall. From that moment his breathing became oppressed, and in a little time he discovered that his pulse, which was unaccountably weak in his left arm, was altogether imperceptible in the right.

On the following day, the 18th of October, he had still further grounds for alarm, the most careful examination could not detect the least pulsation in any artery in the body, nor was the movement of the heart sensible to the hand laid over the breast, an obscure undulating motion could alone be heard when the ear

was for some moments attentively applied to the side of the thorax

His breathing was high and laborious, and could only be performed when the body was nearly erect, inclined a little backward or forward. At night he became worse, and enjoyed no sleep. He occasionally turned on his side with a wish to rest, but this posture encreased the dyspnoea, and could be preserved only for a few moments.

Although this gentleman was perfectly aware of the alarming nature of his symptoms, being himself a physician, he was cheerful, and his countenance was but little disturbed. His appetite was not good, but he was able to eat some chicken or fish for his dinner daily. His digestive organs performed their functions but imperfectly, he suffered great distress from flatulence. Thus he (p. 445) remained for six weeks, with little alteration in his symptoms, except that his strength was observed declining daily and his breathing becoming more difficult. His rest during the night was still more imperfect. During the entire of his distressing period, *no pulse was to be felt in any artery in the body* although I daily made the most careful examination, it was in vain. It would be useless to particularize the various remedies which were ordered from day to day, enough to mention generally, that to procure rest, the compound powder of ipecacuan, lactucarium, and laudanum, were prescribed successively, but with little advantage. The flatulence and derangement of the digestive organs partially yielded to warm cathartic medicines. Purgative and foetid enemata were exhibited every evening. Aether, and repeated blisters, were fruitlessly prescribed to relieve the distressing dyspnoea. Venesection was not resorted to.

This gentleman had been fond of society, and lived too fully, however in the previous history of his health, but little presented itself to throw light on his present situation.

Although always an inhabitant of the City, his chest never shewed any delicacy until within the six weeks previous to his sudden illness, when he had a troublesome cough, which yielded to a change of regimen, blistering, and one small bleeding. It was learned however, that three or four (p. 446) times, within

the last ten years of his life, he had suddenly fallen to the ground in the most unaccountable manner, without getting notice by any previous sensation, or losing consciousness, except for the few moments while the syncope lasted, nor did he experience any unpleasant effect from it. When raised from the ground he felt quite as well as if nothing had happened. In the sudden and unexpected manner in which this syncope occurred, and went off again, it was altogether unlike a common faint.

From all that could be learned, it was plain that to some organic disease of the heart could alone be attributed the remarkable symptoms observed in this case, but the nature of the lesion was altogether concealed. It appeared however too certain that medicine would prove totally unavailing to relieve him. After having laboured under the symptoms already detailed for seven weeks, this gentleman, on the morning of the 6th of December, having passed the previous night wretchedly, was observed, for the first time, to wander a little in his mind. He then fell into a state of stupor, his upper lip became suddenly swollen, and a large livid spot appeared on it. His breathing at first became hurried, then irregular, and finally at 12 o'clock ceased altogether. He expired without appearing to suffer any pain.

(p 447)

DISSECTION

The Body was examined the following day

There was slight oedema of the lower limbs. The abdomen was much distended with air, and contained a small quantity of serum.

There were adhesions of the right lung to the side of the thorax, on separating these, a cavity was discovered containing about a pint of a yellow sero-purulent fluid. This cavity was lined by a membrane of organized lymph, evidently of recent formation. The substance of this lung exhibited in no part any traces of inflammation. The left lung was not adherent, it was perfectly healthy, yet a small quantity of serum was contained in the left cavity.

The heart was large, flabby, and of a yellow colour from fatty deposition. All its cavities were distended with fluid blood, the

semilunar valves of the aorta were completely ossified, but this bony or earthy deposition was not confined to the aorta, it extended to the coronary arteries, which were so completely converted into bone as to be quite solid, having no perceptible cavity except at the distance of an inch from their origin beyond this these vessels were at intervals completely interrupted by small bony specks

Most of those who were present at this (p 448) dissection went away dissatisfied, as the mystery did not appear explained,—why for so long a period no pulse could be perceived in the arteries Some expressed their conviction that the contraction, the result of ossification of the aortal orifice of the ventricle, was sufficient to interrupt the stream of blood, so as to render the effect of the systole of the heart imperceptible in the arteries But such an explanation was in my mind unsatisfactory, as the usual signs of this very common disease were not observed during the life of this individual, nor were the changes in the form of the heart, which it very generally induces, remarked after death In those cases I have witnessed, when the aortic orifice of the ventricle was narrowed by the slow deposition of bone, the heart struggling to overcome the resistance, palpitated violently against the side of the chest, whilst the radial pulse, though small and weak, was always perceptible But in the case I have just related, no pulse whatever was to be felt in the arteries, and the action of the heart was so weak and indistinct, that it could not be felt by the hand placed on the breast, indeed it was doubtful to many whether its motions could be perceived by the ear attentively applied to the side of the thorax The very unusual symptoms observed in this case do not admit of so very simple an explanation, as I believe there is no pathological state more common than ossification of the aortic valves, while I know of no case recorded in which there was such an unaccountable (p 449) absence of all pulse in the arteries remarked for so long a period I have repeatedly observed such state of the valves after death in those in whom, during life, the pulse might have been irregular in every respect, but still always perceptible

I have already adduced a case, page 396, in which, on dissec-

tion, the semilunar valves of the aorta were found in such a state from bony deposition, that water poured from the ventricle or through the aorta was equally retained by the valves. Yet the force of the heart, much debilitated by disease, was sufficient to open these valves at each systole, and although a slow and slender stream was thus circulated, the pulse both at the heart and arteries was always sufficiently distinct.

Such considerations induced me at once to dissent from the opinion that the unusual symptoms which this case presented depended altogether upon a contraction of the aortic orifice of the ventricle.

While the symptoms were so peculiar during life, in the dissection I could observe nothing very unusual, except the total obstruction of both coronary vessels. I have often seen a portion of the root of the aorta, including the semilunar valves, nearly converted into bone, while the (p. 450) orifice and continued trunk of these vessels were perfectly natural, but I have never witnessed an ossification of the coronary arteries so complete or extensive as in this instance. Such a fact was naturally calculated to make an impression on my mind seeking for some elucidation of the question, but it has only suggested the hypothesis difficult to be sustained, that the heart, directly deprived of its due supply of blood by the obliteration of its proper nutrient vessels, might have been suddenly thrown into a state of partial paralysis, hence the feebleness of its efforts, which were inadequate to excite the slightest movement in the arteries. This hypothesis may derive some little support from the consideration, that if the natural supply of blood be entirely cut off from a muscular organ, paralysis will as speedily and certainly follow as if all communication with the brain were interrupted by a division or injury of all the nerves which supply it.

Thus, for instance, let us tie the aorta, or inflict an injury on the spinal marrow of an animal, immediate paralysis of the inferior limbs will as certainly follow the first, as the second experiment. When we reflect that the heart can derive no supply from any other source than its coronary vessels, it will not appear

then so extraordinary that partial paralysis should be the immediate consequence of the complete obstruction of these channels upon which the heart is evidently so dependent. The paralysis, if we dare so (p 451) denominate it, was not in this instance, and indeed seldom is in any case, so complete as to deprive the muscular organ of all power of motion. The heart was still just capable of contracting, and thus passing onwards the blood it received, but so feeble was its impulse, that the slightest motion was not perceptible in any branch of the arterial system.

The syncope which occurs in angina pectoris (an irregular form of which this case is to be considered) I am aware has been ascribed to a temporary spasm of the organ, a state exactly opposed to the paralytic condition into which I have imagined the heart to be thrown in consequence of its coronary vessels refusing to transmit to the heart its proper nutrient fluid. But the length of time during which the heart was apparently at rest in this case, precludes the idea of spasm, indeed it evidently supposes a condition exactly the reverse of it. It should be recollected however that these opposite conditions of convulsion and paralysis are occasionally associated in disease in a manner we are totally unable to account for, and sometimes the one, though more frequently the other, is produced by causes which, were we not to judge by their effects, we might suppose similar. But while I would suggest that the total failure of the pulse in this instance might have resulted from the defective nutrition and paralysis of the heart, I am not at the same time disinclined to admit that the state of (p 452) the semilunar valves of the aorta, *in combination* with the ossified condition of the coronary vessels, might have greatly contributed to impede the circulation or rather suppress the pulse, indeed it is evident that there must have been something mechanical in the cause which thus impeded the action of the heart. Its weakness was not sympathetic, for there was in this case, at first, no symptom of pyrexia. The spirits were cheerful, the appetite good, and debility was not complained of until this gentleman was beginning to feel the consequences of the distressing dyspnoea which affected him. The disease at first

appeared evidently local, but the suddenness of the cessation of the pulse precludes the possibility of our accounting for it on* mechanical principles. Pathological anatomy has indeed informed us that a certain condition of the heart and its coronary arteries is generally found in those who die of angina pectoris (an irregular form of which this case is to be considered) but it cannot explain to us the *modus operandi* of such organic causes in producing those symptoms or external signs by which that disease is recognized. Thus, although we can have but little doubt that in the case we have been just considering the organic seat of the gentleman's (p 453) complaint was to be found in an ossified condition of the coronary arteries of the heart and aortic valves, we are not by such a consideration furnished with any certain means of knowing why the pulse suddenly ceased in every artery in the body at a time when the general health seemed unimpaired.

*Dr Cheyne informs me that he knows two individuals still living in whom for two days there was a failure of the pulse, in one which occurred during an attack of misplaced gout, it was complete, in the other, after an attack of cholera, a faint pulsation could be discovered about four or five times in the minute.

THE END

MEDICAL CLASSICS

VOL 3

March, 1939

NO. 7



CONTENTS

Portrait of John Cheyne - - - - -	698
John Cheyne - - - - -	699
Biography - - - - -	699
Eponym - - - - -	700
Bibliography - - - - -	700
List of Biographies - - - - -	702
Index to Bibliography - - - - -	702
Introduction - - - - -	703
A Case of Apoplexy, in Which the Fleshy Part of the Heart was Converted into Fat J Cheyne, M D	705
Portrait of William Stokes - - - - -	710
William Stokes - - - - -	711
Biography - - - - -	711
Eponyms - - - - -	712
Bibliography - - - - -	713
List of Biographies - - - - -	723
Index of Bibliography - - - - -	723
Observations on Some Cases of Permanently Slow Pulse William Stokes, M D - - - - -	727
Fatty Degeneration of the Heart William Stokes - -	739



JOHN CHEYNE

MEDICAL CLASSICS

VOL. 3

March, 1939

NO. 7



John Cheyne

BIOGRAPHY

- 1777 Born February 3 at Leith, the seaport of Edinburgh, son of a physician and grandson on his mother's side of Mr. Mr William Edmonston, a Fellow of the College of Surgeons Educated in the grammar school of Leith
- 1786 Age 9 Sent to the High School of Edinburgh and placed under the care of Dr Adam, the Head Master Cheyne is supposed to have been unable to keep up with his companions in school and was very unhappy there Later he was placed under tuition of a clergyman of the Episcopal Church of Scotland who taught him a little Greek and Latin
- 1789 Age 12 Helped his father attend poor patients
- 1792 Age 15 Attended medical lectures at the University of Edinburgh
- 1795 Age 19 Obtained a medical degree Appointed Assistant Surgeon to the Royal Regiment of Artillery and was stationed in various parts of England
- 1797 Age 20 Elevated to rank of surgeon and accompanied a brigade of horse-artillery to Ireland where he was present in action against the rebels at Ross and Vinegar Hill
- 1799 Age 22 Left the army and returned to school in Scotland Appointed to the charge of the Ordnance Hospital in Leith Fort and became his father's assistant. Also became associated with Charles Bell and assisted him in necropsies and pathological studies
- 1809 Age 32 Established himself in Dublin but advanced very slowly in medical practice.
- 1811 Age 34 Appointed physician to the Meath Hospital Later lectured at the Irish College of Surgeons

- 1815 Age 38 Appointed by the Lord Lieutenant to be one of the physicians to the House of Industry
- 1820 Age 43 Appointed Physician General to the Army in Ireland, the highest medical rank
- 1825 Age 48 Health became very poor and was forced to limit his practice
- 1831 Age 54 Left Dublin because of illness and settled in Sherrington, England Attended to health of a few villagers and wrote medical articles
- 1833 Age 56 Lost use of right eye by cataract
- 1836 Age 59 Died on January 31, after a gangrene of a foot had developed

EPONYM

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	Reference	Year
Apoplexy	4	1812
	8, 9	1818
Autobiography	15	1843
Bleedings	14	1830
Children, diseases of	2	1801
Comatose diseases	4	1812
Croup	2	1801
Feigned diseases	12	1826
Fever in Ireland	10	1821
Hardwicke Fever Hospital	5	1818
Hydrocephalus	2	1801
Jaundice	7	1818
Larynx, pathology of	3	1809
Melaena	6	1818
Mind, derangement of	15	1843
Rickets	1	1795
Whitworth Hospital	11	1822
Wine and spirits	13	1829

INTRODUCTION TO THE WRITINGS OF JOHN CHEYNE AND WILLIAM STOKES

The preceding volume of MEDICAL CLASSICS was devoted to the work of Robert Adams on heart block. In this volume are reproduced papers by William Stokes on the same condition and on a peculiar type of respiration which had previously been described by John Cheyne. Cheyne's work is also included here.

John Cheyne (1777-1836), after an assistantship to Charles Bell, was one of the founders of the Irish School where he was associated with Abraham Colles, Dominick Corrigan, William Wallace and Francis Rynd. In 1818 he published in the Dublin Hospital Reports a paper *A case of apoplexy, in which the fleshy part of the heart was converted into fat*. Here, for the first time, in a scientific manner (Hippocrates had mentioned the condition) was described a type of respiration which has ever since been known as Cheyne or Cheyne-Stokes' respiration. This variety of breathing is frequently associated with coma from affections of the nervous centers and is now recognized as a sign of very serious illness and usually of impending death.

The phenomenon is explained by a lowering of the sensitivity of the respiratory center. During the period of apnea or cessation of respiration, carbon dioxide accumulates in the blood. The respiratory center is then stimulated and deep breathing results from an attempt to reduce the carbon dioxide to its normal level. But the forced deep breathing depletes the blood below its normal level, at which point, too little carbon dioxide being present to stimulate the respiratory center, a period of cessation of breathing ensues. The cycle is repeated about every one to two minutes. The condition is seen in uremic coma (nephritis), in hypertensive cardiovascular disease, in pneumonia, in meningitis, in brain tumors and in severe toxic states.

The second paper reproduced in this volume is by another physician of the Irish School, William Stokes (1804-1878). His *Observations on some cases of permanently slow pulse*, published in 1846, has linked his name with that of Robert Adams in the Adams-Stokes' syndrome or heart-block.

In the very first sentence of his article, Stokes refers to the publication of Robert Adams and states that he believes further elucidation of this subject will be helpful. He was unaware that his contribution would cause his name to be permanently attached to this syndrome.

William Stokes' name is also retained in medical literature because of his elucidation of that type of respiration known as Cheyne's or Cheyne-Stokes' respiration. Here, too, Stokes quickly refers to the previous description (Cheyne's) and does not realize that his contribution will link his name with his predecessor. In a later publication *Fatty degeneration of the heart* in his book *The diseases of the heart and aorta*, 1854, p. 324, Stokes enlarges his description of this condition of respiration. This article is also reproduced in this number.

The preceding volume of MEDICAL CLASSICS devoted to Robert Adams and this number containing papers by John Cheyne and William Stokes thus form a unit devoted to diseases of the circulation and respiration.



A Case of Apoplexy, in Which The Fleishy Part of the Heart Was Converted into Fat

BY

J CHEYNE, M D & C

Published in *Dublin Hospital Reports*, 2 216-223, 1818

DOUTS having been entertained of the conversion of the fleshy part of the heart into fat, and only one dissection,* in as far as I know, having been published illustrative of that very curious morbid alteration, the following case and dissection have been thought of sufficient importance to meet the public eye

In this dissection, although no chemical experiment was made in proof of the matter into which the heart was converted being fatty, I have no doubt that it was (p 217) so Placed along side of the fat which lay over the ribs, I could perceive no difference, save that it was softer and more easily torn, and rather of a deeper yellow, the substance in question communicated a greasy stain to paper, and the animal oil in viscous drops adhered to the knife used in dissecting the heart I was not, at the time of dissection, aware that the morbid change was so uncommon, or that the specimen which lay before me was perhaps the most complete exemplification ever witnessed of the conversion of the flesh of the heart into fat

The patient certainly died of apoplexy, and apoplexy in this

* See a dissection, illustrative of this morbid change, in an elaborate paper on inflammation of the heart, by Dr Duncan, jun See *Edin Med and Surgical Journal*, Jan 1816

case must have depended upon increased action of the vessels of the head. The heart itself was apparently incapable of communicating much impetus to the circulating mass.

Certainly the dissection would have been more complete had the liver been examined at the same time. I may observe, that although the function of the liver had frequently been disordered during the last ten years of the patient's life, I should not have been surprised had that viscus been found apparently sound. I am persuaded that diseases of the liver, which do not end in structural changes, often produce the greatest disturbance of the constitution, laying the foundation of fatal diseases of distant organs.

A B sixty years of age, of a sanguine temperament, circular chest, and full habit of body, (p. 218) for years had lived a very sedentary life, while he indulged habitually in the luxuries of the table.

This gentleman having had several attacks of the gout in his feet, began a course of magnesia in the year 1813, after which he had only one regular attack of the gout. For many years he had been subject to severe attacks of catarrh, which ended without much expectoration. He had long been subject to oedema of the ankles in the evening, for two or three years before his death (the time could not be ascertained) he had remarked an occasional intermission in the pulse of his heart.

In the latter end of January 1816, he consulted me for a pain in his right side under the false ribs, for which he took calomel at bedtime, and salts in the morning, repeating these once or twice, but he neglected my directions with regard to diet, nay, his appetite being remarkably keen, he ate more than usual, and took at least a pint of port wine or Madeira daily, as was his habit, and this notwithstanding a hard frequent cough, which came on after I was consulted by him.

On the third of February he had walked a good many miles, and came home exhausted, with a fluttering or palpitation of his heart, for he could not well say which, in a degree he had not felt before. He ate as usual, and drank six or seven glasses of wine, which he thought relieved the fluttering. He was sitting

at tea about nine o'clock when he was (p 219) attacked with a severe fit of coughing, during which he fell from his chair insensible I saw him in three or four minutes after his fall, and found him with a contusion on the upper and left side of the frontal bone, he was confused, and unable to recollect himself, he was conscious that some accident had befallen him, the exact nature of which he declared himself incapable of understanding His pulse was extremely irregular and unequal It bounded quickly for several pulsations, then it paused and went on more quickly, but with less force He was pale, but none of the muscles were affected with palsy I lost no time in having blood drawn from his arm to the amount of nearly a pound He gradually became more collected, but his pulse continued irregular and unequal, his countenance became flushed, the cough occurred in suffocative fits, and he complained of pain on either side of the tuberosity of the occipital bone Twelve ounces more of blood were drawn about an hour after the first blood-letting, after which the pulse, though it continued equally irregular, was much softer He complained of the contusion, and of considerable pain behind his ears He was removed to bed, the heat of the extremities was restored, and fifteen leeches were applied over the contusion, and he took two pills consisting of two grains of James's powder, three of calomel and four of compound extract of colocynth

On the 4th of February he had several large bilious stools, his understanding was unimpaired, his recollection restored, and he seemed to comprehend (p 220) the nature of his illness, and he had a sense of fullness in his head, which led me to order him to lose a few more ounces of blood It would be tedious and unprofitable to particularize the medicines which were ordered from day to day for this patient, they consisted of a mild mercurial every second or third day, and squills with ammoniacum, &c These were indicated by the loaded tongue, scanty high coloured urine and dry cough The expectoration being restored, the squills were laid aside on the 15th of February, as they produced nausea and extreme depression of spirits, and bitter infusion with tincture of cardamoms and soda was pre-

scribed On the 19th a horse-radish bath was ordered, in consequence of some slight demonstration of gout On the 21st he had some smart pain, with slight inflammation in the ball of the left great toe About this period he submitted with so much dissatisfaction to a reduced diet, and declared himself so much better after food, that we were induced to allow him a couple of gasses of wine, and to encourage him to take carriage exercise The irregularity in his pulse never ceased On the 1st of March he had a return of the suffocative cough and flushing, with some wheezing, which again seemed to demand blood-letting, which was practised with immediate relief At this period a blister was applied over the region of the heart, which had become the seat of considerable increase of pain, and a discharge was maintained from the blistered surface, by means of ointment of savine and cantharides, about the 4th of March, the sputa became free and concocted His tongue at this (p 221) period was for many days furred and of a dark brown colour, as if it had been sprinkled with ground coffee, it was expanded, and its edge was moist On the 25th of March he began to complain of wheezing, more particularly after exertion, but it sometimes attacked him when he was at perfect rest, his legs and ankles became oedematous, the urine very scanty, much loaded, but without being coagulable by heat At no period of his illness did his pulse beat more than twelve or fifteen strokes in regular succession Various diuretics were given, the digitalis was proposed, but he refused to take it Crystals of tartar, the extractum lactucae virosae, nitrous aether, &c were tried without any benefit

The symptoms of dropsy rapidly increasing, on the 9th of April, he took a draught of infusion of senna, tincture of jalap and Rochelle salts, which operated largely On the 10th of April he was found in bed flushed, speechless, and hemiplegiac How long he had been in that state could not be ascertained, as he had peremptorily ordered his servant not to remain in the chamber with him, and not to come to him in the morning till called All attempts to relieve him were unavailing, his right side continued powerless, and his attempts to articulate

were vain The only peculiarity in the last period of his illness, which lasted eight or nine days, was in the state of the respiration For several days his breathing was irregular, it would entirely cease for a quarter of a minute, then it would become perceptible, though very low, then by degrees it became heaving and quick, (p 222) and then it would gradually cease again this revolution in the state of his breathing occupied about a minute, during which there were about thirty acts of respiration *

The Dissection was made by Mr Crampton, the Surgeon General, and witnessed by Mr John Moore and myself

There was nothing remarkable in the configuration of the body but the great depth of the chest, the anasarcaous swelling of the inferior extremities was considerable

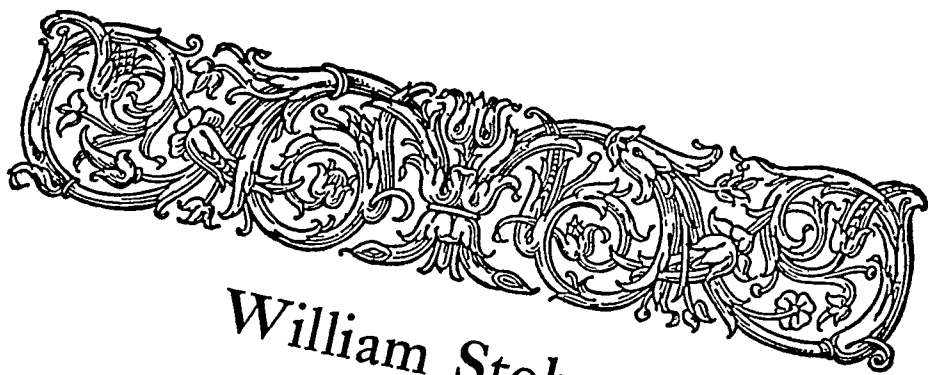
The scalp was bloodless The arachnoid membrane was slightly opaque, there was some fluid between it and the pia mater, and the vascularity of the latter was increased, more particularly over the middle and posterior lobes of the cerebrum of the left side, where, in a large patch, it was thickened and of a deep red colour. The brain was firm, its cortical substance of a pale drab colour There were between three and four ounces of fluid in the ventricles

There were not more than two ounces of fluid in the pericardium The heart was about three times its natural size. The lower part of the right ventricle was converted into a soft fatty substance, the upper part was remarkably thin, and it gradually (p 223) degenerated into this soft fatty substance The cavity of the left ventricle was greatly enlarged The whole substance of the left ventricle, with the exception of the internal reticulated structure and carnae columnae, was converted into fat The valves were sound The aorta was studded with steatomatous and earthy concretions

* The same description of breathing was observed by me in a relative of the subject of this case, who also died of a disease of the heart, the exact nature of which however I am ignorant of, not having been permitted to examine the body after death



WILLIAM STOKES
New Sydenham Society, 1882



William Stokes

BIOGRAPHY

1804 Born in July in Dublin, son of Whitley Stokes, Regius Professor of Medicine in the University and Senior Fellow of Trinity College Received his early education from his father and was an assistant in his laboratory. Was educated in the classics by John Walker, an ex-Fellow of Trinity College and a learned scholar and mathematician.

1823 Age 19 Spent several months in Glasgow and then went to Edinburgh where he became the pupil of William Alison, the Professor of Medicine While a student he prepared and published a volume on the use of the stethoscope

1825 Age 21 Received a medical degree in Edinburgh and returned to Dublin

1826 Age 22 Elected Physician to the Meath Hospital in place of his father who had resigned Became a colleague of Dr Robert Graves A tireless worker in hospital, dispensary and among the poor of the city, "My patients have all one great defect, viz, that instead of giving money, they too often, unfortunate beings, have to solicit it from their medical attendant."

1827. Age 23 Contracted typhus fever while attending the poor in Dublin

1828 Age 24 Married

1832 Age 28 Reported the first case of cholera in the Dublin epidemic

1836 Age 32 Editor, with Robert Graves and William Porter, of the Dublin Journal of Medical Science until 1842.

1838 Age 34 Founded the Dublin Pathological Society

- 1842 Age 38 Became Regius Professor of Physic in the University of Dublin, succeeding his father
- 1861 Age 57 Edinburgh conferred the degree of LL D
- 1865 Age 61 Oxford conferred the degree of D C L
- 1874 Age 70 Elected President of the Royal Irish Academy
Cambridge conferred the degree of LL D
- 1876 Age 72 Forced to retire because of ill health Decorated by the German Emperor William I with the order of "Pour le Merite"
- 1878 Age 74 Died January 6, following a paralytic stroke
Buried in Dublin

Received M D honoris causa from University of Dublin
Fellow of King's and Queen's College of Physicians of Ireland
Honorary member of the Imperial College of Vienna
Honorary member of the Royal Medical Society of Berlin
Honorary member of the Royal Medical Society of Leipzig
Honorary member of the Royal Medical Society of Edinburgh
Honorary member of the Royal Medical Society of Ghent
Honorary member of the Medical Society of the Grand Duchy of Baden
Honorary member of the National Institute of Philadelphia

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 - 20 Hypertrophy of the heart, with rupture of the mitral valves Ibid, 295
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 - 22 Diaphragmatic pleurisy Ibid, 305
 - 23 Impression of the ribs on the lung Ibid, 305
 - 24 Rapid and general dilatation of the air cells Ibid, 495
 - 25 Aneurism of the ascending aorta, extending to the right side Dissecting aneurism of the left ventricle Ibid, 495
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Ibid , 17 327-328, 1840
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336-337
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ducing symptoms of vaccine in the human subject Ibid ,
493-495
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509
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pleura, in cases of disease of the substance of the lung
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posits in the valves Ibid , 333-334
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482
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472-474, 1872
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effusion as a method of treatment Brief report Ibid,
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	Reference	Year
Abdomen, tumors of	74	1848
	134	1871
	138	1872

Abdomen, veins of	44	1841
Aneurism	9	1834
	25	1839
	38	1840
	47, 59, 62	1841
	79, 82	1852
	87	1856
	89	1859
	92	1860
	121	1868
	130	1868
Aorta, dilatation of	106	1865
Aorta, diseases of	85	1854
Cancrum oris	98	1862
Cerebro-spinal meningitis	109, 114	1865
Chest, diseases of	14	1837
Chromidrosis	140	1874
Clavicle, dislocation of	77	1848
Colles, Dr	70	1846
Delirium tremens	64	1841
Diabetes mellitus	93	1860
Diaphragmatic pleurisy	22	1839
Diphtheria	103	1863
(Doctors), mortality of	72	1848
Empyema	36	1840
	124	1868
Enteric fever	141	1873
Fever, lectures on	144	1874
Gall-bladder, cancer of	102	1862
Gastritis	31	1840
Hand, injury of	142	1874
Heart, aortic valve of	41	1840
	107, 112	1865
	123	1868
Heart, atrophy of	49	1841
	65	1842
Heart, diseases of	85	1854
Heart, endocarditis	76	1848

Heart, fatty	43, 57	1841
Heart, hypertrophy of	20	1839
	58	1841
	122	1868
Heart, pericarditis	33	1840
Heart, valves of	48, 56	1841
	76	1848
	84	1852
	97	1862
Hematocele	115	1865
Hydrocephalus	63	1841
Jaundice	61	1841
Kidney	51	1841
	66	1842
Kugler's Handbook	69	1842
Laennec's vesicular emphysema	12	1836
Liver, cancer of	100	1862
	108	1865
Liver, fatty degeneration of	42, 53	1841
Lung	23, 27, 28	1839
	29, 30	1839
	37, 39, 40	1840
	67	1842
	78	1850
	81	1852
Lung, cirrhosis of	45	1841
Lung, gangrene of	46	1841
Lung, scirrhus of	55	1841
	68	1842
Meath Hospital cases	2	1829
Medical education	96	1861
	105	1864
	133	1871
Medical ethics	131	1869
Medical practitioners, mortality of	72	1848
Medicine, theory and practice of	13	1833
Metallic absorption	94	1860
Opium	4	1832

Pelvic abscess	101	1862
Pemphigus	111	1865
Pericarditis	8	1833
	49	1841
Peritoneum	50	1841
Petrie, George	119	1868
Phthisis	6	1832
	53	1841
	124	1868
Psoas abscess	75	1848
Pulse, slow	71	1846
Pylorus, stricture of	99	1862
Rectum, contraction of	90	1859
Retroperitoneal cancer	80	1852
Ribs, fracture of	110	1865
Scrotum, tumor of	116	1865
Small-pox	95	1860
	137	1872
Spinal cord, diseases of	135	1871
Spleen, diseases of	135	1871
State medicine	136	1872
Stethoscope	1	1825
	3	1828
Stomach, cancer of	128	1868
Stomach, perforation of	60	1841
Stomach, ulcer of	113	1865
	120, 125	1868
Tapeworm	126	1868
Testa, work of	15	1838
Thoracic cancer	18	1839
Thoracic pathology	5	1832
	11	1835
Thyroid gland	117	1865
Tympanum	129	1868
Typhoid	19	1839
	127	1868
Typhus fever	16, 17	1839
	32, 34	1840
	83	1852


Observations on Some Cases of Permanently Slow Pulse

BY

WILLIAM STOKES, M D.

Physician to the Meath Hospital

Published in *The Dublin Quarterly Journal of Medical Science*, 2 73-85, 1846

N THE fourth volume of the Dublin Hospital Reports, Mr Adams has recorded a case of permanently slow pulse, in which the patient suffered from repeated cerebral attacks of an apoplectic nature, though not followed by paralysis. The attention of subsequent writers on diseases of the heart, has not been sufficiently directed to this case, which is an example of a very curious and, as there is reason to believe, special combination of symptoms. The following cases will still further elucidate a subject on which there is but little information extant —

Case 1 Repeated pseudo-apoplectic attacks, not followed by paralysis, slow pulse, with valvular murmur

Edmund Butler, aged sixty-eight, was admitted into the Meath Hospital, Feb 9th, 1846. He stated that his health had been robust, until about three years ago, at which time he was suddenly seized with a fainting fit, in which he would have (p 74) fallen if he had not been supported. This occurred several times during the day, and always left him without any unpleasant effects. Since that time he has never been free from these attacks for any considerable length of time, and has had,

at least, fifty such seizures The fits are very uncertain as to the period of their invasion, and very irregular as to their intensity, some being much milder and of shorter duration than others They are induced by any circumstance tending to impede or oppress the heart's action, such as sudden exertion, distended stomach, or constipated bowels There is little warning given of the approaching attack He feels, he says, a lump first in the stomach, which passes up through the right side of the neck into the head, where it seems to explode and pass away with a loud noise resembling thunder, by which he is stupified This is often accompanied by a fluttering sensation about the heart He never was convulsed or frothed at the mouth during the fit, but has occasionally injured his tongue The duration of the attack is seldom more than four or five minutes, but sometimes less, but during that time he is perfectly insensible He never suffered unpleasant effects after the fits, nor had anything like paralysis His last fit occurred about one month before admission He has never heard it remarked that there was anything peculiar about his heart or pulse At first he found that spirits was the best restorative or prophylactic, but lately he has not used them, being "afraid to die with spirits in his belly"

On admission, he was haggard and emaciated, but seemed the wreck of what was once a fine, robust man He lay generally in a half drowsy state, but when spoken to was perfectly lively and intelligent

What he sought admission into hospital for was an injury he had sustained, by a fall, on the left shoulder, this, however, was of no consequence, and he soon recovered under the use of an anodyne liniment

He makes no complaint of his general health, his appetite is good, and he sleeps well, bowels regular, and, in fact, all the (p 75) functions are in good order He has, however, some cough, attended with a slight mucous expectoration His intellectual powers are perfect He complains of a feeling of chilliness over the body, and is never warm except when close to the fire This has long been the case, and he says that

each day he gets a periodical chill, generally in the afternoon, which is followed by increased heat of the surface, but without sweating

On percussion, the chest is universally resonant The respiratory murmur loud, and combined, more especially posteriorly, with large mucous râles The impulse of the heart is extremely slow, and of a dull, prolonged, heaving character, giving the idea of feeble as well as of slow action The first sound is accompanied by a soft bruit de soufflet, which is prolonged until the commencement of the second sound, and is heard very distinctly up along the sternum, and even into the carotid arteries The second sound is also imperfect, though very slightly so, the imperfection being much more evident after some beats than after others Pulse twenty-eight in the minute, of a prolonged, sluggish character, the arteries pulsate visibly all over the body, but no bruit is audible in them They appear to be in a state of permanent distension the temporal arteries ramifying under the scalp, just as they are seen in a well-injected subject All the other cavities and viscera appear to be in a perfectly healthy state Urine, neither acid nor alkaline, of a high colour, clear, specific gravity 1010, and does not afford a precipitate with nitric acid He was ordered four ounces of wine, and a liniment for the shoulder

February 17th The pulse has varied from twenty-eight to thirty in the minute The cardiac murmurs continue unchanged, that with the first sound is plainly audible over the upper part of the thorax, but most evident along the course of the aorta

21st Pulse thirty Cough quite gone Has been complaining of a feeling of the "lump in the stomach" for several (p 76) days, and was once threatened with the approach of a fit during the night, it passed off, however, without becoming a true attack

23rd An edematous swelling has appeared behind the left ear, extending up the side of the head, slightly tender on pressure, no redness, has had no shiverings, tongue clean, bowels free Pulse up to 36

March 3rd On the 24th of February the edema had left the left side, and made its appearance on the right, from which it was dispersed on the following day by the application of poultices. The pulse fell to the usual range.

His aspect and general health are greatly improved since his admission. He gets up every day, and is much stronger. The shoulder is almost quite well. The pulse has continued at about 28 or 30. He says he has had two threatenings of fits since his admission, both occurring in bed, and both warded off by a peculiar manoeuvre as soon as he perceives symptoms of the approaching attack, he directly turns on his hands and knees, keeping his head low, and by this means, he says, he often averts what otherwise would end in an attack.

4th He has mentioned, for the first time to-day, that he is much troubled with irritability of the bladder, so that he is obliged to rise very often during the night to pass water. His urine was examined and found to be healthy. Specific gravity 1.015. He has been subject to this for the last twelve months, and it probably depends on the disease of the prostate so common in old men.

We remarked to-day, that on listening attentively to the heart's action, we perceived that there were occasional semi-beats between the regular contractions, very weak, unattended with impulse, and corresponding to a similar state of the pulse, which thus probably amounts to about 36 in the minute, the evident beats being only 28, so that there must be about eight of these semi-beats in the minute, but these signs are very indistinct.

(p 77) 14th Health improving, has had no fit, no cough. Both morbid sounds are loudest over the sigmoid valves, and thence along the aorta. No semi-beats audible. Pulse 29, not quite so prolonged as before.

18th He complains to-day of palpitation, and a feeling of uneasiness about the heart,—the impulse is increased and is found to consist of two distinct pulsations. The bruit, with the first sound, is somewhat louder than before. On listening attentively, there are heard occasional abortive attempts at a

contraction, probably about four in the minute. They do not destroy the regular intervals between the stronger sounds, but are heard, as it were, filling up the interval. We could not recognize a corresponding state of the pulse, which counted 32 in the minute.

After this, little change was observed. His health continued improved, he had no fit, or threatening of one, and he appeared anxious to leave hospital, in order to go to work again. The pulse continued about the same standard, and regular, I believe it never exceeded 36 in the minute since his admission into hospital. The physical signs remained unchanged, as was observed the day before he left the hospital. An examination of the lungs revealed no morbid sign, the bronchial râles, heard at the time of admission, having quite disappeared.

He left the hospital in March, intending to go for some time into the country before he resumed work. He was advised to be careful not to over-exert himself, and never to allow himself to be bled when threatened with one of his fits.

Within the present month (June) this patient has been again admitted into hospital. The cardiac phenomena remain as before, but a new symptom has appeared, namely, a very remarkable pulsation in the right jugular vein. This is most evident when the patient is lying down. The number of the reflex pulsations is difficult to be established, but they are more than double the (p. 78) number of the manifest ventricular contractions. About every third pulsation is very strong and sudden, and may be seen at a distance, the remaining waves are much less distinct, and some very minor ones can be also perceived. These may possibly correspond with those imperfect contractions which have been already noticed in the heart. The appearance of this patient's neck is very singular, and the pulsation of the veins is of a kind which we have never before witnessed.

He has had scarcely any of the cardiac attacks since he was discharged, he refers the premonitory sensations to the right supra-clavicular region, but states that he has often experienced them without any loss of consciousness following.

The next case exhibits a similar condition of the heart, but the pseudo-apoplectic attacks did not occur

Case II Anemic condition, very slow pulse, with valvular murmur, death, apparently from syncope

A man, upwards of fifty years of age, was admitted, presenting much of the general characteristics of senile phthisis. His skin was of a pale yellowish tint, and his whole appearance indicated great debility. He complained of cough and dyspnea, but did not refer any of his sufferings to the region of the heart. His pulse was generally 35 in the minute, though occasionally rising to 40. The action of the heart was regular, but feeble, and a valvular murmur with the first sound, precisely similar to that in mitral-valve regurgitation, was always audible. This became louder on ascending the sternum, and was most intense on the right side, at the anterior articulation of the second rib. We were inclined to consider this as an example of mitral valve disease, and supposed at first that the aortic murmur might result from anemia. The patient died without any struggle. On dissection, the mitral valve was found healthy. The aortic valve was thickened and narrowed, but not permanently patent. Water poured into the aorta did not pass into the ventricle, the heart was soft and flabby, and, though not an example of complete fatty degeneration, was covered by a (p. 79) very thick layer of fat. The aorta presented several atheromatous patches.

In this case the second sound remained normal, there was no regurgitation into the ventricle. The valve was sufficiently diseased to cause a murmur with the first sound, but from its power of closing completely, the second remained unaltered.

The co-existence of aortic murmur with the symptoms of weakened heart in both these cases is important, for if it should appear that this combination is one of frequent occurrence, we shall have less difficulty in recognizing an obscure disease of the heart. There is no reason to believe that there is any necessary connection between the weakened, or fatty state of the heart, and disease of the aorta or its valves, but that the combination is frequent appears probable from the following considerations.

First,—In the two cases which have now been given, we see the combination of slow pulse with aortic murmurs.

Secondly,—In one of these, organic disease of the aorta was found on dissection

Thirdly,—In Mr Adams' case the aortic valves were studded with specks of bone* The state of the aorta is not noticed,

* Mr Adams has given this important case at length in the fourth volume of the Dublin Hospital Reports The following extract is abridged from the original report

"An officer in the revenue, aged 68 years, of a full habit of body, had for a long time been incapable of any exertion, as he was subject to oppression of his breathing and continued cough In May, 1819, in conjunction with his ordinary medical attendant, Mr Duggan, I saw this gentleman he was just then recovering from the effects of an apoplectic attack, which had suddenly seized him three days before He was well enough to be about his house, and even to go out But he was oppressed by stupor, having a constant disposition to sleep, and still a very troublesome cough What most attracted my attention was, the irregularity of his breathing, and remarkable slowness of the pulse, which generally ranged at the rate of 30 in a minute Mr Duggan informed me that he had been in almost continual attendance on this gentleman for the last seven years, and that during the period he had seen him, he is quite certain, in not less than twenty apoplectic attacks Before each of them he was observed, for a day or two, heavy and lethargic, with loss of memory He would then (p 80) fall down in a state of complete insensibility, and was on several occasions hurt by the fall When they attacked him, his pulse would become even slower than usual, his breathing loudly stertorous He was bled without loss of time, and the most active purgative medicines were exhibited As a preventive measure, a large issue was inserted in the neck, and a spare regimen was directed for him He recovered from these attacks without any paralysis Edema of the feet and ankles came on early in December, his cough became more urgent, and his breathing more oppressed, his faculties too became weaker

"November 4th, 1819, he was suddenly seized with an apoplectic attack, which in two hours carried him off, before the arrival of his medical attendant

"Dissection fifty-six hours after Death—The right auricle of the heart was much dilated The right ventricle externally presented no appearance whatever of muscular fibers, it seemed composed of fat through almost its whole substance, of the same deep yellow colour as that which occupied the place of the left lung The reticulated lining of the ventricle, which here and there allowed the fat to appear between its fibers, alone presented any appearance of muscular structure

"The left ventricle was very thin, and its whole surface was covered with a layer of fat Beneath this, the muscular structure was not a line in thickness, it had degenerated from its natural state, was soft, and easily torn, and a section of it exhibited more the appearance of liver than of a heart The septum of the ventricles presented the same appearance In both ventricles, even in the lining fibers, yellow spots, where fat had occupied the place of muscular structure, were to be observed The whole organ was remarkably light, the valves were all sound, except those of the aorta, which were studded with specks of bone, but elsewhere were cartilaginous and elastic, from which they derived a disposition to remain closed, a fluid gently injected from the ventricle would pass them, still, when the heart was reversed and water poured from the ventricle upon them, their valves retained it, its weight was not sufficient to separate the edges of the thickened valves There was much fluid blood contained in the heart" Dublin Hospital Reports, vol iv, p 396

(p 80) but the carotids and middle arteries of the dura mater presented bony depositions

Fourthly —In a case published by Dr Cheyne, in the second volume of the Dublin Hospital Reports, in which the heart had greatly degenerated into fat, the valves were sound, but the aorta was studded with atheromatous concretions

Fifthly —Professor Law, in his original and important observations on the connection between disease of the heart and brain, in the seventeenth volume of the Dublin Journal of Medical Science, gives an account of the appearances observed in (p 81) examining the body of the Earl of K , and states that the pulse was remarkably infrequent, sometimes not exceeding twenty-five beats in the minute The patient was subject to syncope The examination was made in London, and no mention is made of the state of the muscular substance of the heart, but it was found that the semilunar valves of the aorta were thickened and partially ossified, so that they could not effectually have closed the orifice The brain was extensively softened, and the ventricles distended with a limpid fluid, and the substance of the left hemisphere, both cortical and medullary, was so softened as to present an almost creamy consistence The arteries at the base of the brain presented opaque yellow depositions

This case was, in all probability, an example, if not of fatty degeneration, at least, of a weakened state of the ventricle It is another example of the combination of a singularly slow pulse, tendency to syncope, and disease of the aortic valve.

I am indebted to Mr Adams for the particulars of an interesting case of slow pulse, with lesion of the aortic orifice, and remarkable softening of the left ventricle The patient had been in excellent health up to within a few months previous to his death He had no palpitation, dyspnea, nor irregularity of the pulse He had been exposed to various debilitating causes, and, when seen by Mr Adams, presented a slow pulse and visible pulsation of the arteries of the neck The pulse fell to below forty, and a loud bruit de soufflet could be heard along the aorta and in the region of the heart Mr Adams found the heart to be one of the most friable he had ever met with, break-

ing down under the slightest pressure of the fingers The valves of the aorta were less diseased than could have been expected, considering the state of the pulse, and the visible pulsations noticed in all the arteries The valves were not inadequate to perform their functions, from their being diseased or altered in their structure of form, but (p 82) the calibre or area of the aorta was so expanded that they could not prevent reflux into the ventricle

I have lately seen another case presenting the combination of a pulse under thirty, repeated pseudo-apoplectic attacks, not followed by paralysis, and distinct valvular murmur with the first sound The gentleman is advanced in life, but enjoys very good general health He has always found that the attacks were increased whenever he was lowered by regimen or medicine He takes a moderate quantity of wine, and is thus able to ward off the malady

The preceding observations go to prove that the combination of the permanently slow pulse, with a diseased condition of the aortic opening, is not uncommon We owe to Dr Corrigan, the important practical observation, that in cases of permanent patency of the aortic valve, the patients do not generally bear a reducing system, but are best treated by a tonic, or even stimulating regimen, and I entirely agree with Professor Law in his opinion, that the pseudo-apoplectic attacks, in cases of slow pulse and weakened left ventricle, are more frequently attributable to a diminished or feeble circulation, than to one of active congestion

We have thus seven cases of permanently slow pulse In five, organic disease of the aorta or the valves, or both, was discovered on dissection, and in four, a manifest aortic murmur existed, in two of the cases the second sound was normal, and in two there was the murmur of regurgitation in the aortic valve *

* In Dr Robert Smith's published cases of fatty degeneration of the heart, the valves were healthy The patients were both very old women, and no stethoscopic observation is recorded The pulse was very slow These patients were not under Dr Smith's care See also the important case of fatty degeneration of the heart, communicated to the Pathological Society by Mr Carmichael—Transactions of the Society for 1840

I do not believe, however, that the aortic murmur is any direct sign or necessary combination of the weakened heart. Its occurrence in these cases manifestly arises from the combination (p. 83) of aortic disease, and we have abundant evidence that a weakened heart, without aortic disease, may exist, and yet no murmur be produced. In the typhoid softening of the heart, we have rarely recognized a valvular murmur, and where it did occur, there was reason to believe that carditis had supervened. The typhoid softening, with a pulse from 30 to 40, commonly exists without any murmur.

In Dr. Cheyne's patient a remarkable state of the respiration was observed for some time before death. "For several days," says Dr. Cheyne, "his breathing was irregular, it would entirely cease for a quarter of a minute, then it would become perceptible, though very low, then by degrees it became heaving and quick, and then it would gradually cease again. This revolution in the state of his breathing occupied about a minute, during which there were about thirty acts of respiration."

I once witnessed this condition of breathing, but had not an opportunity of making a dissection. The patient was a gentleman of about sixty years of age, and of spare habit, his ailments commenced with a sudden and severe attack of dyspnea, which subsided, leaving him to all appearance perfectly well, this returned at irregular intervals. When I saw him he had a full, soft, pulse, and a loud though varying murmur with the first sound, propagated into the aorta. At the top of the sternum the murmur was intense, and on several occasions the arteries seemed to pulsate with a force much greater than could be expected from the impulse of the heart. For more than two months before his death, this singular character of respiration was always present, and so long would the periods of suspension be, that his attendants were frequently in doubt whether he was not actually dead. Then a very feeble, indeed barely perceptible inspiration would take place, followed by another somewhat stronger, until at length high heaving, and even violent breathing was established, which would then subside till the next period of suspension. This was frequently a quarter of a minute in

duration I have little (p 84) doubt that this was a case of weakened and probably fatty heart, with disease of the aorta

Professor Law has lately communicated to me the following note of a case under his care in Sir Patrick Dun's Hospital It is an example of a very weak heart, with the pseudo-apoplectic attacks

Colin Baird, admitted March 10th, 1846, aetat 44, states that about three years ago he was suddenly attacked with a fit, which he describes as coming on without any warning, his sight suddenly failed, and he fell down, this fit only continued a minute or so, leaving him stupid for some time After the first attack the patient states that his health was bad for two months, when he resumed his trade, being occasionally attacked at irregular intervals, varying from two to three months, till the attacks became more frequent, and at length came on ten or twelve times in the twenty-four hours These attacks are induced on by smoking, or drinking spirits The patient, who complained of weakness, appeared worn out, and older than he really is, pulse thirty, heart's action very weak, and the sounds scarcely audible

Dr Law treated the attacks as examples of syncope, and prescribed a generous diet and stimulating medicines On one occasion the pulse fell so low as twenty-four in the minute It was observed, occasionally, that after each distinct beat of the heart there was a species of commotion of the organ, as if another pulsation was attempted These peculiar minor pulsations also occurred in the case of Butler, and were observed on several occasions It would seem as if in the weakened heart, there were two kinds of contractions, in one, the systole of the heart is broken up, as it were, into a number of slight and irregular contractions, giving a permanently irregular and rapid pulse This is the sort of pulse which is so common in the combination of hepatic and cardiac disease, such as occurred in the case of Mr Colles In the second form, the contractions are complete, and with long intervals, and this is seen (p 85) in the cases now under consideration But the occurrence of those minor pulsations is interesting, as shewing a connecting

link between the cases of weakened heart, with a rapid though irregular pulse, and those where the pulse is slow and regular

The preceding observations are published with the view of drawing the attention of the Profession to a combination of cerebral and cardiac phenomena, of which our knowledge is still imperfect

THE END



Fatty Degeneration of the Heart

BY

WILLIAM STOKES

In *The Diseases of the Heart and the Aorta* Dublin, Hodges and Smith, 1854,

pp 320-327

GENERAL DIAGNOSIS OF THE DISEASE

IF IT be inquired how far we have gone, since the time of Laennec, in establishing the diagnosis of this affection, it will appear that as yet but little has been done. Laennec declared that he knew of no means by which the diagnosis of fatty degeneration of the heart could be made, and Dr Ormerod, writing in 1849, observes, that "the most extreme cases detailed may show that the diagnosis on general or physical grounds is almost impossible." "We cannot," he says in another place, "predict with certainty in any case that we shall find this lesion after death, but it is difficult for any pathological observer not to be led to suspect the existence of a disease in the repetition of the same circumstances under which he has seen it occur previously."

The diagnosis of this condition is not only possible but often free from difficulty, at least where the disease is confirmed. On the other hand, minor degrees of the affection are to be determined less by direct signs than by some general characters

(p 321) The diagnosis turns upon three points —

- 1 The existence of physical signs and symptoms of diminished force of the heart

2 The occurrence of certain symptoms, principally referrible to the brain, which indicate either anaemia on the arterial, or congestion on the venous side, of the cerebral circulation

3 Symptoms referrible to the respiratory function, which appear to arise from deficient power in the right ventricle

It is still to be determined how far we can distinguish during life the cases of weakened and dilated hearts, such as have been already described, from those of fatty degeneration. Microscopical anatomy shows that in many of the former class there is more or less of the adipose deposit. And it is plain that to the practical physician there is a relation between the diseases, for similar exciting causes concur in their production, and in both the effect of the disease is traceable to the same vital condition, namely, debility of the heart.

In its higher degrees of development this affection is most frequently met with in persons who have passed the prime of life, but minor shades of it occur in young patients, especially where there is a complication with other visceral diseases, as, for example, pulmonary tubercle. On the other hand, some of the most remarkable instances are found in very old and long bedridden subjects, and it is observed that in such cases the alteration is not confined to the heart, but extends also to the voluntary muscles, and even to the skeleton, producing atrophy and fragility of the bones, with a great deposit of oily matter in the cavities and cancelli of the osseous tissue*. Though varying and apparently opposite, its exciting causes are generally reducible to those which would induce a depraved haematosi. The over-fed and luxurious, on the one hand, and the victim of want, on the other, are liable to the disease.

Although complication with various local diseases, or with a special morbid state such as gout, is not uncommon, yet judging from the good state of the general health, and the absence of lesion in the digestive, respiratory, and nervous systems after death, (p. 322) we must admit that the fatty heart may be, in a large number of cases, practically considered as a local affection.

* Of this condition numerous specimens may be seen in the Museum of the Richmond Hospital.

It is probable that in these uncomplicated examples, the disease attains its greatest development, and exhibits the most characteristic symptoms

The symptoms may be divided into those referrible to the nervous, respiratory, and circulating systems

Of the nervous symptoms, the most important are the attacks of apoplexy, or pseudo-apoplexy, to which these patients are so liable. This affection differs from ordinary sanguineous apoplexy in three particulars, namely, the frequent repetition of the seizures, the rarity of consequent paralysis, and the fact that there is not only danger from an antiphlogistic treatment, but benefit, both remedial and preventive, from the use of stimulants

In some cases the character of these attacks approaches to that of syncope, and it is difficult to say how much of the affection is produced by the want of arterial, or the stasis of venous blood. In the earlier periods of the case the attack is more of syncope, in the later it becomes apoplectic. The attacks may occur without warning, and the first seizure be fatal. This, however, is rare. In most cases there are numerous seizures at irregular intervals, and in some, sensations referrible to the epigastrium and head, having a resemblance to the epileptic aura, give notice to the patient that he is about to be attacked. In some there is a momentary unsteadiness in walking, and in others a tendency to faint, which may be dissipated by any ordinary stimulus, while in the more decided cases the patient becomes suddenly comatose, a condition which may be preceded by loss of memory and a lethargic state. I have at present under my care a patient whose earlier attacks were syncopal, they are now apoplectic, and come on during sleep, each one being preceded by a slight convulsion. On recovery, and after all the comatose symptoms have passed away, he remains for half-an-hour unable to recognize his most intimate friends and relations, even his wife he has mistaken for his mother. This patient is 63 years of age. This latter symptom has been observed in a case of weak heart which lately occurred in Dublin; the patient frequently failing to recognize friends who had been his intimates for half a century. The duration of (p 323)

the attack is generally short, paralysis is rare, and when it occurs does not seem referrible to any anatomical lesion of the brain

The question as to whether these singular attacks are dependent upon deficient arterial supply, or rather upon venous congestion, is a difficult one, but it does not involve any important point of practice. It is true, that whatever arrests the action of the heart will retard the flow of blood in the veins of the head, but it could not cause a state of hyperaemia. The opinion that the apoplectic seizures are owing to deficient arterial supply seems the most tenable. The suddenness of the attack, and, in many instances, the rapidity of the recovery, are in favour of this view. I have noticed one case in which, on the occurrence of the premonitory symptoms, the patient, by hanging his head so that it rested on the floor, used to save himself from an attack. A case lately occurred to me of an aneurism of the aorta, in which three successive ruptures of the sac took place, with intervals of several days. Each rush of blood was attended with the best-marked syncopal coma and convulsions. Finally, dissection does not show any extraordinary congestion of the brain, and we learn from auscultation that the action of the heart is feeble.

This view of the cause of the attacks appears to be still further corroborated by the occurrence of symptoms of a similar nature in the case of dilated mitral opening by Dr Fleming, which has been already given. Here the ventricle was hypertrophied to a great degree, but the patient suffered from regurgitation into the left auricle.

We can, therefore, only adopt in part the plan of treatment suggested by the late Mr Carmichael, which was to relieve the vessels of the head by venesection, while at the same time stimulants should be used to excite the action of the left ventricle.

Symptoms referrible to the respiratory function—There is no evidence that the existence of this disease, even in an aggravated form, is an exciting cause of any organic affection of the lung. On the other hand, the researches of Ormerod, Quain, and others, have demonstrated the frequent combination of fatty heart with pulmonary disease, but in such cases we may hold

Fatty Degeneration of Heart 743

that the conditions (p 324) of the lung and heart have little, if any mutual relation, they are rather to be considered as the secondary accidents of a general morbid state

But there is a symptom which appears to belong to a weakened state of the heart, and which, therefore, may be looked for in many cases of the fatty degeneration I have never seen it except in examples of that disease The symptom in question was observed by Dr Cheyne, although he did not connect it with the special lesion of the heart It consists in the occurrence of a series of inspirations, increasing to a maximum, and then declining in force and length, until a state of apparent apnoea is established In this condition the patient may remain for such a length of time as to make his attendants believe that he is dead, when a low inspiration, followed by one more decided, marks the commencement of a new ascending and then descending series of inspirations This symptom, as occurring in its highest degree, I have only seen during a few weeks previous to the death of the patient I do not know any more remarkable or characteristic phenomena than those presented in this condition, whether we view the long-continued cessation of breathing, yet without any suffering on the part of the patient, or the maximum point of the series of inspirations, when the head is thrown back, the shoulders raised, and every muscle of inspiration thrown into the most violent action, yet all this without râle or any sign of mechanical obstruction The vesicular murmur becomes gradually louder, and at the height of the paroxysm is intensely puerile

The decline in the length and force of the respirations is as regular and remarkable as their progressive increase The inspirations become each one less deep than the preceding, until they are all but imperceptible, and then the state of apparent apnoea occurs This is at last broken by the faintest possible inspiration, the next effort is a little stronger, until, so to speak, the paroxysm of breathing is at its height, again to subside by a descending scale

In other cases we see the symptom of sighing to occur in a different manner at irregular intervals the patient draws a

single (p 325) deep sigh, especially when he suffers from fatigue, want of food, or of his ordinary stimulants This is the commonest form of the affection * In one case it was always most evident when the patient was lying down.

The phenomena of circulation are next to be considered

We are in want of a sufficient number of observations to enable us to declare whether in the earlier periods there is any marked character of pulse as to strength, frequency, or regularity Many of the recorded cases of the minor stages of the disease are deficient in accurate observations of the pulse, but it may be held that no special character of pulse has been established In some the pulse has been weak, rapid, and irregular, in others it does (p 326) not seem to have differed materially from that

* The sighing respiration may be observed in persons who are labouring under certain forms of gastric or hepatic derangement, and is occasionally a symptom of undeveloped gout It disappears under appropriate treatment, and probably indicates a temporary weakness of the heart I lately saw a case of long-continued sighing, in which it had apparently arisen from depression and anxiety of mind, but had, as it were, become a habit The patient was a lady of very nervous disposition A feeble murmur attended the first sound of the heart In this case there was probably no organic lesion, for the symptom had long existed, and there were no signs of progressive disease

Sufficient attention has not as yet been directed to this character of respiration It is, when confirmed, almost pathognomonic of a weak and, in all probability, a fatty heart, but whether it is to be taken as indicative of the predominance of the fatty change on the right side of the heart is still an open question Laennec has described a form of asthma with puerile respiration, and he attributes the disease and the signs to some special modification of the nervous influence He observes, that he has never met with it except in persons affected with mucous catarrh, and holds that dyspnoea, arising from the mere increase of the natural want of the system for respiration, can never amount to asthma without the catarrhal complication But he further speaks of adults and old persons who have puerile respiration without catarrh, and who, though they are not, properly speaking, asthmatic, are short-breathed, and liable to dyspnoea on the slightest exercise

It is possible that in some of these cases at least, the heart may be in an incipient stage of fatty degeneration I have observed the symptom in a gentleman of about 70 years of age, who has many symptoms of a weak heart The action of that organ is regular, but the impulse is extremely feeble, and the pulse compressible The sounds, especially the first, are very indistinct, there is no bronchial râles, but well-marked puerility of respiration exists over every portion of the thorax He principally complains of dyspnoea on exercise, or on any mental agitation, and the symptoms have only become prominent within the last eighteen months So far as the permanent condition of the respiration is concerned, this case answers perfectly to Laennec's description of dyspnoea with puerile respiration See Dr Forbes's translation of the work of Laennec,—Article, Asthma with Puerile Respiration

of health* But in confirmed cases we may meet with three important characters of pulse.—

1 The pulse somewhat accelerated, but occasionally intermitting, its strength may be but little altered

2 The extremely weak, rapid, irregular, and tingling pulse (*pulsus formicans*)

3 The permanently slow pulse, the rate of which varies from 50 to 30 in the minute, or even less

It is probable, that in the third class of cases, or those with a permanently slow, though distinct and regular pulse, the disease has either advanced to a great degree, or has at all events affected the different portions of the heart equably, and that we may attribute the weak and irregular pulse to conditions of the heart in which only certain portions of the organ have degenerated, or where there is a great difference between the right and left sides of the organ It is further probable that the heart may be in two very different conditions previous to the commencement of the fatty change, and that in the case with irregular pulse, a merely weakened and perhaps dilated condition has preceded the deposit of fat globules in the muscular fibre, while in the third class the change has occurred without previous alteration in the structure or mode of action of the heart Some of the cases observed in persons who have been long bedridden, and who have died from rupture of the left ventricle, are of this description Additional observations, however, are necessary to elucidate this subject

If we inquire whether irregularity of pulse is indicative of valvular disease in this affection, we must consider that the symptom may be met with in cases of weak, dilated hearts, without valvular disease, and therefore, that we might expect it in the fatty degeneration On the other hand, the occurrence of cases with a perfectly regular though slow pulse is a remarkable fact In well-marked cases, where irregularity, rapidity, and smallness (p 327) of pulse exist, we ought not, even

* This circumstance is worthy of consideration in connection with that which I have recorded as occurring in cases of the softening of the heart in typhus, in many of which the pulse is quite a fallacious guide in determining the strength of the left ventricle

though there be no valvular murmur, to declare too strongly against the existence of valvular obstruction, bearing in mind, first, that the very weakness of the heart may prevent the appearance of murmur, and next, that valvular disease is not infrequent combination with fatty heart. In most of the cases which I have seen, this valvular affection was at the aortic orifice, and the pulse was slow and regular.

MEDICAL CLASSICS

VOL 3

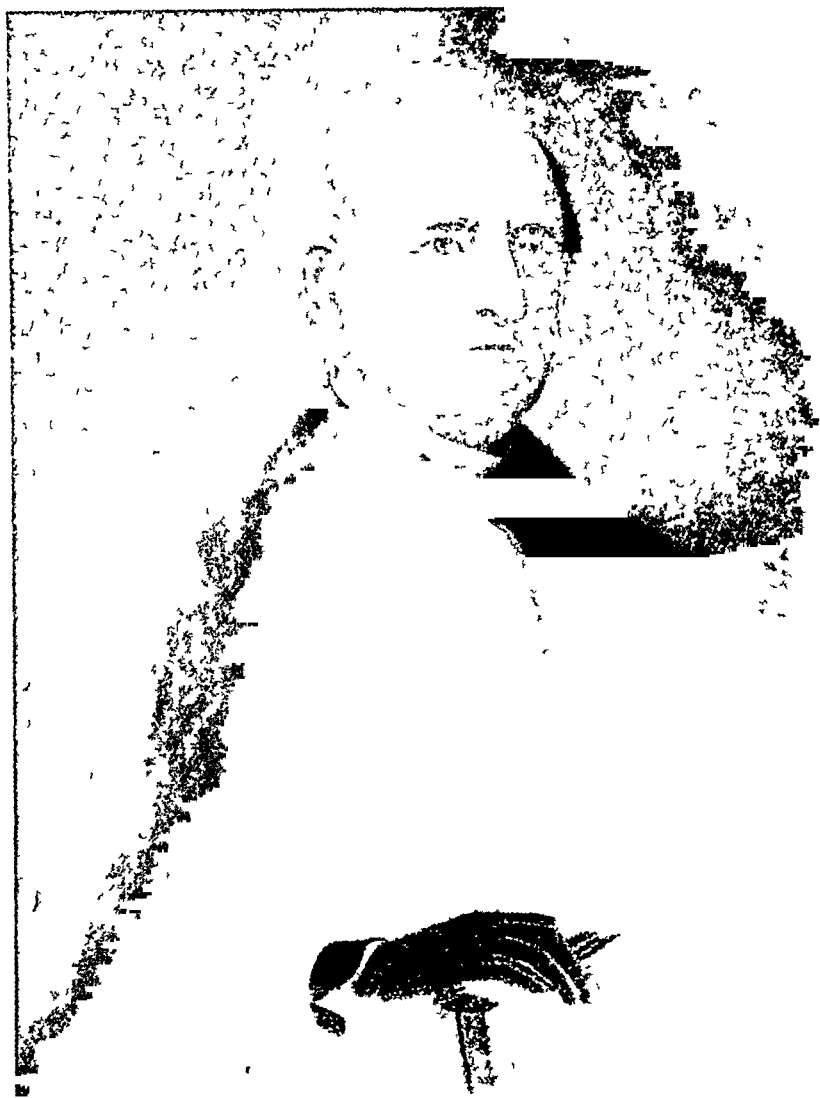
April, 1939

NO 8



CONTENTS

Portrait of Gurdon Buck	- - - - -	748
Gurdon Buck	- - - - -	749
Biography	- - - - -	749
Eponyms	- - - - -	750
Bibliography	- - - - -	750
Biographies	- - - - -	757
Index to Bibliography	- - - - -	757
Buck's Extension	Gurdon Buck, M D - - - -	762
Buck's Fascia	Gurdon Buck, Jr, M D - - - -	783
Buck's Operation	Gurdon Buck, M D - - - -	790



GURDON BUCK
[1807-1877]

MEDICAL CLASSICS

VOL 3

April, 1939

NO 8



Gurdon Buck

BIOGRAPHY

- 1807 Born May 4, on Fulton Street, New York City, the son of Gurdon Buck, at one time a prominent New York merchant. Attended Nelson Classical School, then entered business. Began medical studies under Dr Thomas Cook.
- 1830 Age 23 Received M D degree from College of Physicians and Surgeons. Interned in New York Hospital for 18 months on the medical service.
- 1832 Age 25 Continued studies in Paris, Berlin and Vienna for $2\frac{1}{2}$ years.
- 1835 Age 28 Made a second trip to Europe and was married in Geneva, Switzerland, to Henrietta E Wolff, of that city.
- 1837 Age 30 Appointed visiting surgeon to the New York Hospital.
- 1845 Age 38 Devised Buck's operation—excision of the knee joint.
- 1846 Age 39 Appointed visiting surgeon to St Luke's Hospital.
- 1847 Age 40 Became Fellow of the Academy of Medicine at its organization.
- 1848 Age 41 Described fascia (Buck's), a continuation of Colles' fascia upon the penis.
- 1852 Age 45 Visiting surgeon at the New York Eye and Ear Infirmary until 1862. Vice-president of the New York Academy of Medicine until 1856.
- 1861 Age 54 Described extension (Buck's), an improved

method of treating fractures of the thigh Attended wounded of Civil War after battles of Antietam and the Wilderness

1872 Age 65 Visiting surgeon to Presbyterian Hospital

1877 Age 70 Died of uremic poisoning on March 6, leaving a widow, two daughters and three sons, two of whom were doctors of medicine

Also President of New York Pathological Society

Trustee of College of Physicians and Surgeons.

Trustee of New York Eye and Ear Infirmary

Trustee of New York Dispensary

Trustee of New York Ophthalmic and Aural Institute

Gurdon Buck was a very religious man, charitably inclined to the poor, with a sense of professional honor which was puritanical in its idealism (Amer Jour Surg, n s, 8 442, 1930)

EPONYMS

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- 2 FASCIA A continuation of Colles' fascia upon the penis *A new feature in the anatomical structure of the genito-urinary organs not hitherto described* Trans Amer Med Assn, 1 367-371, 1848
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INDEX TO BIBLIOGRAPHY

	References	Year
Abdominal cavity abscess	93	1876
Abscess, iliac fossa	28	1857
	86	1874
	91	1876
Acupressure	61	1869
Acupuncture needle	51	1866
Air passages, foreign body	66	1870
Air passages, surgery	69	1870
Anatomy, genito-urinary organs	12	1848
Aneurism, aorta	32	1858
	53	1867
	72	1871
Aneurism, femoral	31	1858
	57	1869
	67	1870
Aneurism, treatment	59	1869
Appendix, perforation	40	1861
Artery, carotid	25	1855
	30	1857
Bladder, bougie in	16	1851
	64	1870

Bladder, cancer	29	1857
Bladder, puncture	65	1870
Bladder, stone in	18	1852
Brain, hernia	1	1840
Burns, contraction	89	1875
	94	1876
	95	1877
Burns, face	73	1871
	77	1872
	87	1874
Cancer, bladder and prostate	29	1857
Cancrum oris	52	1866
Carotid ligation	25	1855
	30	1857
Cerebri, hernia	1	1840
Chain-saw conductor	90	1875
Cheiloplastic operation	50	1866
Civiale's lithotrite	16	1851
Cleft-palate	49	1866
Cook, Dr T, biography	76	1871
Croup	15	1851
Diphtheria	79	1872
Elbow joint, excision	3	1841
	10	1846
Epithelioma, larynx	47	1865
Epithelioma, lip	37	1860
	55	1868
Extension, see fractures of thigh		
Face, burns	73	1871
	77	1872
	87	1874
Face, reconstruction	46	1764
	48	1866
	68	1870
	71	1871
Fascia (Buck's)	12	1848
Fauces, ulceration	23	1855
	43	1862

Femoral aneurism .	31	1858
	58	1869
	67	1870
Femur, fractures, see fractures of thigh		
Fistula, vesico-vaginal	21	1854
Fractures, thigh	24	1855
	36	1860
	38, 39	1861
	54	1867
Genito-urinary organs	12	1848
Glottis, edema	11	1847
Glottis, ulceration	23	1855
Goldring, B , autopsy	6	1843
Hare-lip	49	1866
	78	1872
Heart, pistol wound	56	1869
Hernia, cerebri	1	1840
Hernia, strangulated	8	1845
	44	1863
	45	1864
	57	1869
	75	1871
Humerus, exsection of head	88	1875
Ileum, intussusception	41	1862
Iliac fossa, abscess	28	1857
	86	1874
	93	1876
Intussusception	41	1862
Jaw destruction	48	1866
Jaw fracture	17	1852
Knee-joint derangement	27	1856
Knee-joint operation	9	1845
	22	1854
Larynx, edema	13	1848
	14	1851
	33	1859
Larynx, growths in	19	1853
	47	1865

Lip, cancer	37	1860
	55	1868
Lip, hare	49	1866
	78	1872
Lip restoration	35	1860
	55	1868
	62	1869
	68	1870
	83	1872
	85	1873
Lithotomy	34	1860
	63	1870
	81	1872
Lithotrity	63	1870
	81	1872
Neck, wry	20	1853
New York Hospital	4	1841
Nose, plastic operation on	82	1872
Olecranon, excision	5	1843
Operation (Buck's)	9	1845
Palate, cleft	49	1866
Parotid region, wound	25	1855
Plastic surgery	68	1870
	71	1871
	94	1876
	95	1877
Prostate, cancer	29	1857
Pus migration	92	1876
Rectum, stricture	42	1862
Rhinoplasty	82	1872
Scrotum, tumor	74	1871
Surgical cases	2	1840
Suture-pin conductor	60	1869
Syphilitic ulceration	23	1855
	43	1862
Temple, tumor	84	1873
Tongue, hypertrophy	70	1871

Torticollis	20	1853
Trachea, pressure on	32	1858
Tracheotomy	15	1851
	23	1855
	26	1856
	33	1859
	79	1872
Tumor, infra-auricular	80	1872
Tumor, forehead	84	1873
Typhlitis, peri-, abscess	91	1876
Urethra, breaking of catheter in	42	1862
Urethra injury	7	1844
Vesico-vaginal fistula	21	1854
War, Civil, fractures of thigh in	54	1867
Wry-neck	20	1853

BUCK'S EXTENSION

The problem of extension in treatment of fractures has been an important one from earliest times. Hippocrates describes in some detail in his chapter *On Fractures* the difficulties encountered with extension, especially in fractures of the thigh. The Scamnum or Bench of Hippocrates is well known from illustrations in many old surgeries and medical histories. On this extension-bed with windlasses the patient's legs were lengthened as counter extension was made in the axillae. The bed does not appear to have been constructed with any thought of comfort and its use to-day would bring forth an interesting reaction from the patient-victim.

Celsus, Scultetus, Guy de Chauliac and Paré all used some means of extension and counter extension but without much comfort or efficiency. Paré seems to have used his "pulley" to effect reduction but did not continue the traction during healing. Every surgeon who wrote on fractures bemoaned the lack of a machine or apparatus for satisfactory treatment of fractures of the thigh. F. H. Hamilton lists in detail expressions in this vein from John Bell, Benjamin Bell, Velpeau, Nelaton and Malgaigne. I. S. Cutter (*Internat Abst Surg*, Nov 1929, p 393-396) gives, in addition to the above, references to this subject by H. A. Martin, W. C. Daniell and L. A. Dugas.

In 1768 Percivall Pott published his famous *Some Few Remarks upon Fractures and Dislocations*, in which he advocated the establishment of the "physiological doctrine" and stated that fractures of the thigh could be corrected by proper position without extension. This position was flexion of leg on thigh, flexion of thigh on body, support of leg and body by pillows and inclination of the body toward the side of injury. This principle was advanced by Robert Chessher (1750-1831) of Leicestershire who achieved a great reputation through his double inclined-plane to support fractured legs (Garrison). This plane became the accepted method of treatment and is recommended by Sir Astley Paston Cooper for fractures of the thigh-bone below the trochanter.

"To prevent this horrid distortion and imperfect union, two circumstances are to be strictly observed: the one is, to elevate the knee very much over the double inclined plane; and the other, to

place the patient in a sitting position, supporting him by pillows during the process of union. The degree of elevation of the body which is required will be about forty-five degrees, but it may be readily ascertained by observing the approximation of the fractured extremities of the bones, and this position is requisite for relaxing the psoas and iliacus muscles, and thus preventing the elevation of the upper part of the bone. In no other manner can the great deformity I have described be prevented. When, by this posture, the extremities of the bones are brought into proper apposition, and all projection of its upper portion is removed, either the splints may be applied which are commonly used in fracture of the thigh-bone, or, what is better, a strong leathern belt, lined with some soft material, should, by means of several straps, be buckled around the limb, and be confined by means of a strap around the pelvis." (Sir Astley Paston Cooper, *Treatise on Dislocations*, 2 Amer from 6 Lond ed, Boston, Lilly, 1832, p 190)

This was the state of affairs when Gurdon Buck became interested in fractures at the New York Hospital about 1855. The system he instituted for obtaining traction of the thigh was immediately recognized as an important adjunct in the treatment of fractures, was widely adopted and is still in use to-day, properly called Buck's extension. Modern surgeons use this extension for either lower or upper limb fractures and when combined with the Thomas splint they have an efficient method of treatment. During the World War this treatment made thousands of injured comfortable, permitted transportation and allowed healing in a correct position.

The report of Dr. Buck on the use of extension as read before the New York Academy of Medicine on March 20 and April 17, 1861 and published in the Transactions of that institution is here reproduced in its entirety.



Buck's Extension

An Improved Method of Treating Fractures of the Thigh
Illustrated by Cases and a Drawing

BY

GURDON BUCK, M D

Surgeon to New York Hospital

Read before the New York Academy of Medicine, March 20th, and April 17th, 1861
Published in The Transactions of the New York Academy of Medicine, II, 232-250, 1861

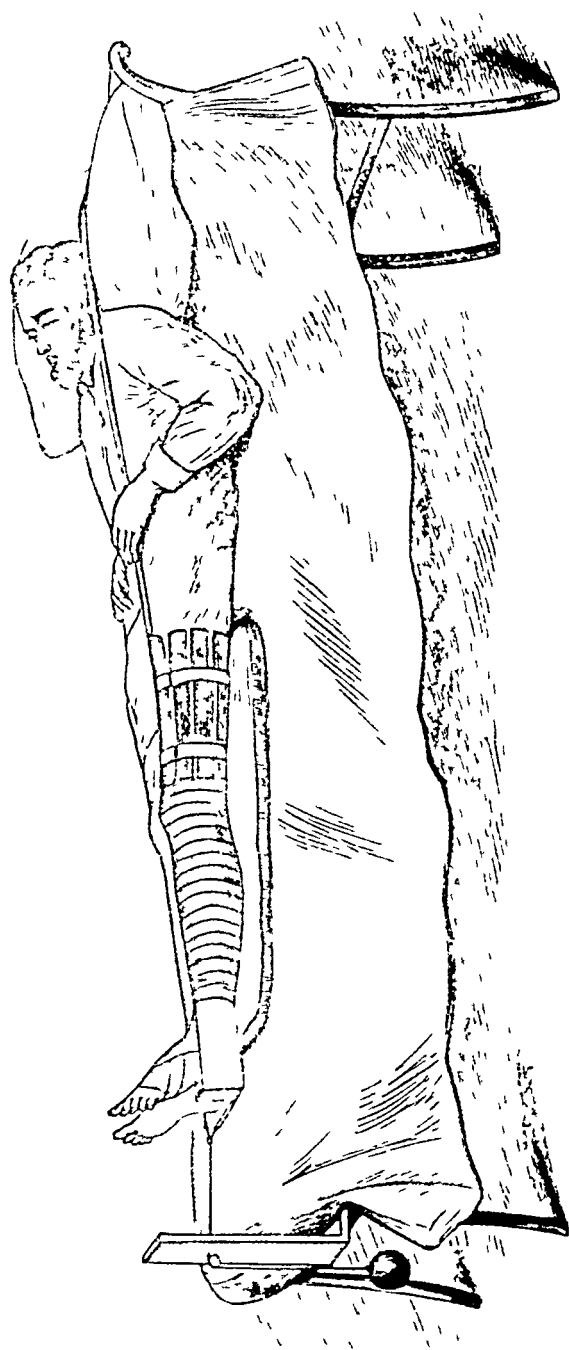


RACTURES of the thigh-bone constitute an important class of injuries requiring surgical aid. The long period of confinement indispensable for their cure, and the irksomeness of one constantly fixed position necessarily imposed for their treatment, are conditions seriously affecting the health and comfort of the patient, which the ingenuity of the surgeon may well task itself to alleviate. Any method of treatment proposing an alleviation is worthy of attention, especially if it attains this result without prejudice to the essential object which should always be kept in view—that of restoring the limb, if possible, to its original condition.

Two principal methods of treating this fracture have prevailed in the flexed position, on the double inclined plane, and in the straight position, with long splints. The first method is defective in its means of making extension and counterextension. The second is preferable to the first in fulfilling this important indication, both methods impose absolute confinement (p 234) to one position on the back, and are attended with great difficulty in answering the calls of nature. In both methods

Table of Twenty-one Cases of Fracture of Thigh, Treated by an Improved Method

No	Sex	Age Years	Seat of Fracture	Original shortening Inches	Weight used Lbs	Where Treated	Date of Accident	Date of Discharge	Shortening after Treatment	Remarks
1	Male	5	R middle and lower third	1+	6	Private	Sept 3, 1860	6 weeks	0	Sustained treatment comfortably
2	"	1 1/2	R middle	1+	5	St Luke's	Sept 10, "	"	0	Refractured 15 days after injury, and treated <i>de novo</i>
3	"	24	R middle	2 1/2	14	N Y Hospital	" 13, "	88 days	1 1/2	Accidental re-fracture on 53d day, while raising limb by spontaneous effort. Solid reunion 35 days after
4	Fem	12	L middle	1 1/2	12	"	" 21, "	80	1 1/2	Fleshy person, bore treatment well
5	"	49	R middle and lower third	1 1/2	12	"	" 29, "	57	1 1/2	"
6	Male	25	L middle	1 1/2	20	"	Oct 7, "	65	1 1/2	Fleshy and heavy person
7	Fem	50	R near condyles	1 1/2	12	"	" 21, "	80	1 1/2	Refractured 6 weeks after injury,
8	Male	19	R middle	2 1/2	12	"	Nov 5, "	78	1 1/2	and treated <i>de novo</i>
9	Fem	54	R 3 inches from knee	"	7	"	Dec 10, 1861	90	"	Fleshy person
10	"	36	R middle	1 1/2	12	"	Jan 29, 1861	16	"	Complicated by delirium tremens, refractory
11	Male	20	L middle	1 1/2	12	"	Feb 11, "	60	1	Refractory. Loosening perineum
12	"	34	R middle and lower third	1 1/2	25	"	Feb 19, "	52	1	band and sliding to foot of bed
13	"	41	R middle	2 1/2	13	"	" 23, "	15	1 1/2	"
14	"	20	R 2 inches from trochanter	1 1/2	5	"	" 25, "	16	1 1/2	"
15	"	12	R 2 in below trochanter	1 1/2	10	"	Mar 1, "	12	1 1/2	"
16	"	31	L middle and lower third	2	12	"	" 8, "	16	1 1/2	Previous hip joint disease, followed by shortening
17	Fem	58	Cervix	1 1/2	7	"	" 9, "	15	1 1/2	"
18	Male	6	R middle	1 1/2	4	St Luke's	Feb 28, "	14	0	Surround treatment comfortable
19	"	64	R cervix	1 1/2	12	Brooklyn City Hos	Jan 1, "	64	0	Set up at pleasure in bed
20	"	55	R middle	1 1/2	11	"	Dec 17, 1860	16	0	Fracture of same bone 20 years before
21	"	40	L middle	1 1/2	12	"	Feb 1, 1861	70	1	"



of treatment, a great variety of appliances have been devised, all claiming their advantages, but none entirely overcoming the difficulties encountered in practice

To adapt such fixtures to the limb as will allow uninterrupted extension to be kept up without producing intolerable pain, and excoriation, is the chief difficulty. Until bands of adhesive plaster were employed for this purpose, the difficulty was insuperable. This simple invention may be regarded as forming an era in the treatment of fracture of the femur.

Its first employment in the New York Hospital was suggested by an article in the January number of the New York Journal of Medicine, of 1851, by Josiah Crosby, M D, of New Hampshire, to which Dr F D Lente, of Cold Spring, then Resident Surgeon, directed my attention. The advantages of the method were obvious. No hesitation was felt in making trial of it. From that time to the present it has been in constant use, and subjected to the test of an experience embracing hundreds of cases.

The result of treatment since the application of adhesive plaster, as already established, is an increase in the number of adult cases, as well as children, cured without any shortening, and a diminution of the difference of length where shortening of the limb was unavoidable.

The method here submitted is intended to combine the benefit derived from adhesive plaster with other important advantages to the patient. It diminishes materially the discomfort and irksomeness of his long confinement to one position inseparable from the use of other methods. This it accomplishes by dispensing entirely with the long splints, and maintaining constant extension by the action of a weight and pulley connected with an elastic band.

We make no claim to originality. The method was suggested by observing its happy application by Dr H G Davis, of this city, to the treatment of morbus coxarius, and it has now been subjected to varied tests sufficient to justify us in making it known through this Academy to the profession, (p 235) soliciting for it their favorable consideration. We are encouraged to do so by the favorable judgment of many professional colleagues.

whose mature experience qualifies them to pass judgment on such a question. Before relating the accompanying cases, a description of the apparatus and fixtures employed is here submitted.

The appliances to the limb itself for making extension are the same as have been in use in our hospitals for some years past, as follows —

A roller bandage, commenced at the toes in the usual way, is continued to the ankles, where it is temporarily arrested. A band of adhesive plaster, $2\frac{1}{2}$ to 3 inches broad, and long enough to allow the middle of it to form a loop below the sole of the foot (the ends extending above the condyles of the femur), is then applied on either side, in immediate contact with the limb, from the ankles upwards. Over this the bandage is continued as high up as the plaster. A thin block of wood of the width of the plaster, and long enough to prevent pressure over the ankle, is inserted into the loop, and serves to attach the extending cord, and this cord is fastened to an elastic rubber band (such as is used for door springs), which passes round the block. By this arrangement, elasticity is combined with extension.

The limb is now prepared to be extended. The arrangement of the pulley is very simple. A strip of inch board, three inches wide, is fastened upright to the foot of the bedstead, and perforated at the height of four or five inches above the level of the mattress. Through this hole the extending cord is passed, and on the further side of the strip a screw pulley is inserted at the proper level, and over the pulley, the cord, with a weight attached, is to play. The footboard of the bedstead, if there is one, may be perforated, and the screw pulley inserted on the outside of it, so as to answer the purpose. To allow the application of lotions to the thigh during the first few days of treatment, the ends of the adhesive bands should stop short at the condyles of the femur, and be turned down. Afterwards, they may be replaced upon the thigh, the bandage continuing over them preparatory to the application of coaptation splints, which should be added at this stage of the treatment.

(p. 236) The coaptation splints, of the ordinary sort, should be

secured by three elastic bands made of suspended webbing, fitted with buckles. These have the advantage of keeping up uniform concentric pressure as the swelling of the limb diminishes. Counter extension may be maintained by the usual perineum band lengthened out and fastened to the head of the bedstead. India-rubber tubing, of one inch caliber, stuffed with bran or a skein of cotton lamp-wick drawn through it, makes an excellent perineum strap. A piece two feet long, with a ring fastened at each end, answers an admirable purpose. A strip of canton flannel wound spirally round the perineal band protects the skin, and is to be renewed as often as soiled. A thin, wedge-shaped hair cushion, to raise the heel above the mattress, and a bag filled with bran or sand, to place on the outside of the foot, to prevent rotation outwards, complete the appliances requisite to carry out this method of treatment. The amount of weight to be employed must be determined by the resistance to be overcome and the tolerance of each patient. More than five or six pounds will rarely be required for children under eight years of age. For older patients, eight to fifteen pounds will ordinarily be sufficient, though as much as twenty-five pounds were used in one case reported in this article. As the treatment advances, and the tendency to shortening diminishes, the weight may be reduced.

Case 1 Edward S. Charles, a delicate child, 5 years old, residing on the corner of 33d street and 3d avenue, was visited the 3d September, 1860, in the evening. That afternoon he had sustained a fracture of the right thigh, at Astoria, from the falling of the heavy handle of a garden roller upon his limb. The thigh presented the obvious characters of fracture at the junction of the middle and lower thirds, with a shortening of rather more than an inch. Wrapped the limb in a pillow, and supported it in a semiflexed position till the necessary preparations could be made for applying the weight and pulley fixtures. On the following day put it up in the manner already described, with a bag containing three pounds of shot attached to the cord. The limb was supported on a hair cushion, to keep (p. 237) the heel clear of the mattress. The thigh was left exposed for cooling.

lotions to be applied to the seat of injury. A frame was placed over the limb, to keep off the bed-clothes. It was supposed the weight of the body would afford sufficient resistance to the extending power, and thus render unnecessary a counter-extending perineum band. It was found, however, that the patient, when restless, slid toward the foot of the bed, till the weight touched the floor, thus relieving himself of the extension. About the 6th day, a perineum band was added. The lotions were discontinued, and coaptation splints applied round the thigh. The weight was increased to six pounds.

From this time forward the patient sustained the treatment very contentedly. He was allowed to sit up in bed to take his meals, no difficulty was encountered in the use of the bed-pan. At the end of four weeks from the accident the limb was examined, and firm union ascertained to have taken place without shortening, as determined by accurate measurement. For greater security the limb was again bandaged, and the coaptation splints reapplied, but without continuing the extension.

At the end of six weeks, patient was allowed to be taken out of bed, and began to use his limb. His restoration was rapid and complete, without any difference in the length of the limbs.

On the 17th December, three months and a half after the injury, the patient was again examined, both limbs found to be of the same length, the fractured limb had regained all its functions.

Case 2 Mrs Julia Callaghan, residing No 404 4th avenue, brought her boy, an infant 21 months old, to St Luke's Hospital, on the 25th September, 1860, with fracture of the right femur near its middle, that had happened 15 days before, in consequence of a fall from a flight of stairs. Firm union had already taken place, with a shortening of over an inch, and considerable callous deposit around the seat of fracture. The patient had been under no appropriate treatment since the injury. On the day following admission, after the administration of ether, the adhesions were broken up by flexing and rotating the fragments of the femur on each other, and forcibly (p 238) extending the limb till free motion could be performed at the seat of fracture. The limb

was then put up with coaptation splints surrounding the thigh, and a weight of five pounds attached to the cord. A counter-extending perineum band was also applied, its ends fastened to the head of the bed.

The little patient soon became accustomed to the fixtures, and submitted contentedly to the restraint during the remainder of the treatment. At the expiration of eight days, firm union was found to have taken place without any shortening. Some discomfort was experienced from the pressure of the perineum band, and the difficulty of keeping the parts dry and cleanly, it was therefore left off, and the weight diminished to three pounds. At the expiration of another week the extension was left off, and only coaptation splints continued. The patient was allowed to sit up much of the time, without any disturbance of the treatment. Before leaving the Hospital, on the 31st October, he had begun using his limb. On the 18th December, more than three months after the injury, he had regained perfect use of his limb, which was ascertained by measurement to be of the same length as its fellow.

Case 3 Sam Lippencott, æt 24 years, New Jersey, wheelwright, admitted September 13, 1860, into Ward No 3, 1st Surgical Division New York Hospital, under the care of Dr Markoe, with fracture of right thigh near its middle, with $2\frac{1}{2}$ inches shortening. The accident happened a short time before admission. The limb was placed without delay on the double inclined plane, and cold water dressings used.

Sept 22d, ninth day. The weight and pulley fixtures applied with 14-lb weight attached to the cord, also, a counter-extending perineum band and coaptation splints.

Sept 24. Shortening reduced to three-fourths of an inch.

Oct 10th. Shortening half inch.

Nov 5th. On fifty-third day after the injury the fixtures were removed, and union found firm, but with little callus surrounding the fracture. The patient, having already raised his limb several times from the bed by voluntary effort, was repeating the attempt in presence of the students, when a refracture took place with an audible snap, immediately followed (p 239) by

a shortening of one and a quarter inches The same treatment was resumed without delay

Nov 19th Fourteen days after the refracture, union had again become quite firm, and the shortening reduced to half an inch

Dec 11th Thirty-five days after refracture Union firm, measurement the same Patient's health suffered no material deterioration under the treatment

Discharged Jan 2d, 1861

Case 4 Matilda Duford, a healthy girl, æt 12 years, admitted Sept 21st, 1860, under Dr Markoe's care, into Ward No 2, First Surgical Division N Y Hospital, with fracture of left thigh near the middle, one inch shortening The limb was placed on the double inclined plane, cooling lotions applied

On the 26th, the limb was put up in the pulley apparatus, 12 lbs, to the extending cord The counter-extending perineum band was applied, and coaptation splints around the seat of fracture

Nov 10th Fiftieth day after the injury, the apparatus was removed, union firm, shortening scarcely half an inch For continued security, the bandage and coaptation splints were continued a while longer, and passive motion of the knee-joint directed to overcome the rigidity

Dec 10th Patient about on crutches, the shortening remains the same

Discharged Dec 27th, 1860

Case 5 Mrs Bridget Farrel, æt 49 years, Ireland, a strong and very fleshy person, was admitted Sept 29, 1860, into Ward No 2, 1st Surgical Division N Y Hospital, under Dr Markoe, four hours after falling down a flight of stairs, about 18 feet, striking on her right thigh, thereby fracturing the femur at the junction of its middle and lower third

Shortening of $1\frac{1}{2}$ inches had taken place The limb was placed on the double inclined plane, and so remained till Oct 7th, when it was put up in the pulley apparatus with 12 lbs weight attached Perineum band and coaptation splints were applied

(p 240) Oct 18th Progressing favorably, shortening scarcely one inch

Nov 1st Patient progresses comfortably under the treatment Union is quite firm Shortening full half an inch

Nov 26th Fifty-seventh day Removed fixtures Union firm Shortening half an inch

Dec 12 Patient about on crutches, was discharged cured

Case 6 Thomas Dennery, æt 25 years, laborer, native of Ireland Admitted October 7th, 1860, under Dr George A Peters, into Ward No 7, North House, 1st Surgical Division N Y Hospital, with fracture of the left thigh at its middle, caused twenty-four hours before, by falling from a height of 15 feet Shortening of an inch and a half had taken place

The limb was placed on the double inclined plane, and water dressings used On the 14th, the pulley apparatus with counter-extending perineum band and coaptation splints applied, a twenty-pound ball attached to the extending cord The treatment progressed without any occurrence requiring notice

Nov 8th The weight reduced to 12 lbs

Nov 28th Union had become firm, the position of the limb good Shortening full a quarter of an inch

Dec 3d On the 57th day, the apparatus left off Shortening scarcely half an inch

Jan 8th, 1860 Discharged

Case 7 Mrs Joanna Saxton, æt 50 years, native of Ireland, fleshy and heavy Admitted under Dr George A Peters, on the 21st Oct, 1860, to Ward No 2, 1st Surgical Division N Y Hospital, with fracture of the right femur near the junction of the shaft with the condyles, that happened a few minutes before admission, from a fall from the front door entrance to the stoop, the height of one step only, one and three quarter inches shortening ascertained, by measurement, to exist

The limb kept on a double inclined plane for three days

Oct 24th, put up in the pulley apparatus in the usual way, with a 12-lb weight attached to the extending cord, with perineum band and coaptation splints

(p 241) Nov 2d Shortening reduced to one inch

Dec 5th Apparatus re-adjusted Shortening half an inch

Dec 11th On the 51st day, apparatus removed

Discharged Feb 28th, 1861

Case 8 Louis Sufke, æt 19 years, native of Germany, admitted under Dr George A Peters, Nov 5, 1860, to Ward No 4, 1st Surgical Division N Y Hospital, from on board ship Five weeks previously his right thigh had been fractured during a storm Immediately after the accident he was placed in a bunk, his limb confined in straight lateral splints, without extension, and kept in this way till he was brought to the hospital

The fracture was found to have taken place at the middle of the femur Union had already become firm, with a shortening of two inches and a quarter The position of the foot was true

11th Nov, six weeks after the injury, it was decided, on consultation, to refracture the femur and treat it *de novo*

The operation was performed as follows —

The patient having been etherized, a block was placed cross-wise under the limb at the seat of fracture Dr P then made forcible pressure, one hand over the knee, the other over the upper part of the thigh The adhesions thus broken up without difficulty, free motion was re-established between the ends of the fragments Powerful extension and counter-extension by pulleys were then employed to rupture any remaining adhesions and stretch the limb as nearly as possible to its full length The long, straight splint was then used, the limb subjected to extension and counter-extension, according to the method heretofore practiced in the hospital An abrasion of the perineum having taken place from pressure of the counter-extending band during the use of the pulleys, it was necessary to leave off the usual perineum band, and substitute bands of adhesive plaster for counter-extension The limb continued in this apparatus for three days, when Dr Peters kindly consented to make trial of the pulley apparatus, which was applied on the 14th November The counter-extension by (p 242) adhesive plaster was continued A weight of $12\frac{1}{2}$ pounds attached to the extending-cord maintained the limb at a shortening of $1\frac{3}{4}$ inches

Nov 22d The shortening was reduced to $\frac{3}{4}$ of an inch, and

union had become moderately firm The position of the limb is excellent, and patient's general condition entirely satisfactory

Nov 28 Shortening half an inch, full measure

Dec 6 Abrasion of the perineum has healed On the inner aspect of the lower part of the thigh and upper part of the leg is a superficial ulcer of about four inches in diameter, which was produced by the fastenings applied when the limb was subjected to the pulleys Suitable dressings, with a many-tailed bandage, were employed, without interfering with the continuance of the extension

Dec 11 Shortening scarcely half an inch Union firm Discontinued extension, but continued the coaptation splints

Discharged Jan 28th, 1861

Case 9 Margaret Lucas, æt 54 years, widow, Scotland, a very fleshy person, admitted Dec 10, 1860, into Ward No 2, 1st Surgical Division N Y Hospital, under Dr T M Halsted, with fracture of right thigh about three inches above the knee, with a shortening of three inches

The limb was placed on the double inclined plane, on the 3d day following, put up with the pulley apparatus, with 7 lbs weight attached, and perineum band The shortening was at once reduced to one and a half inches

Jan 2 The perineum band dispensed with for the past six days, and the weight of the body alone relied upon for counter extension Shortening scant half an inch

Jan 21 Six weeks after injury, union firm Shortening half an inch Transferred limb to double inclined plane

Jan 30 Removed double inclined plane

March 16 Patient up and using crutches Shortening, by measurement, five eighths of an inch Discharged, March 18th, cured

Case 10 Bridget Riley, æt 36 years, Ireland, intemperate Admitted Jan 29, 1861, into Ward No 2, 1st Surgical (p 243) Division N Y Hospital, under Dr T M Halsted, fracture of right femur near the middle, with shortening of one and a half inches

The limb was at once put up in pulley apparatus, with 7-lb weight attached and perineum band

Feb 1 Patient refractory from delirium tremens, tore off apparatus, required to be confined in bed by straps

Feb 2d Had slept tolerably well with the aid of anodynes Apparatus reapplied, 12 lbs weight added

Feb 4 After suspension of anodynes, again became refractory, and disengaged the apparatus

Feb 6th No return of delirium Apparatus is worn quietly The subsequent treatment was continued without interruption

March 16th Patient is up on crutches Shortening, by measurement, $\frac{5}{8}$ of an inch Discharged, March 30th, cured

Case 11 Daniel Reed, æt 18 years, Ireland, laborer Admitted Feb 11, 1861, into Ward No 4, 1st Surgical Division N Y Hospital, under Dr T M Halsted, with fracture of left thigh at its middle Shortening of one inch Limb was placed on the double inclined plane till the fourth day after admission, then put in straight position, with weight and pulley apparatus Five pounds were as much as the patient could bear without pain

March 3d Twentieth day The weight was increased to 12 pounds, without pain

March 16th Thirty-three days after injury Union is quite firm Shortening $\frac{1}{4}$ inch

April 12th Allowed to be out of bed No shortening

Case 12 John Robertson, aged 34 years, Ireland Admitted Feb 19, 1861, into Ward 9, 2d Surgical Division N Y Hospital, under my own care, with fracture of right femur at junction of middle and lower third, occasioned by the passage of a wheel of a heavy-loaded vehicle over the limb Abrasion of the cuticle and ecchymotic discoloration mark the seat of injury, the softened feeling of the muscles shows that they have suffered violent contusion The limb (p 244) shortened $1\frac{1}{2}$ inches The weight and pulley apparatus applied without delay, 10 pounds weight attached to the extending cord

Feb 26th The weight increased to 15 pounds, and the shortening reduced to an inch

March 9th Weight increased to 25 pounds

March 18th Two successive attacks of erysipelas of the thigh interfered with the application of the coaptation splints till within a few days

March 18th Four weeks since injury Union is becoming firm Shortening still one inch

March 25th Patient interferes with the pulley fixtures, thereby interrupting the extension

April 12th Union solid Shortening one inch Left off apparatus A better result might have been obtained in this case if the patient had not thwarted our efforts by his interference

Case 13 John Consar, aged 41 years, Ireland, laborer Admitted Feb 23d, 1861, into Ward 3, 1st Surgical Division N Y. Hospital, under Dr Halsted, with fracture of right thigh, near its middle Shortening of $2\frac{1}{2}$ inches The limb was placed on double inclined plane, and on the following day put up in the weight and pulley apparatus A weight of 13 pounds was attached to the cord, the action of which overcame the shortening entirely

March 4th Apparatus readjusted, still no shortening

March 16th On the 21st day, shortening one fourth of an inch

April 12th Union firm Shortening scarcely half an inch Left off apparatus

Case 14 Thomas Higgins, aged 20 years, Ireland, porter Admitted Feb 25, 1861, into Ward 3, 1st Surgical Division N Y Hospital, under Dr T M Halsted, with fracture of right femur, at two inches below the trochanter Shortening $\frac{3}{4}$ of an inch The limb placed on the double inclined plane

March 2d On fifth day, the limb put up in the weight and pulley apparatus, with a weight of 5 pounds attached

(p 245) March 16th On the 19th day, patient progresses favorably Shortening $\frac{1}{2}$ of an inch

April 12th Union firm Shortening $\frac{1}{4}$ inch Left off apparatus

Case 15 Charles Schilling, 12 years, Germany Admitted March 1st, 1861, into Ward No 3, 2d Surgical Division N Y Hospital (under Dr Buck), fracture of right femur two inches

from the trochanter and below the origin of the cervix Shortening $1\frac{1}{4}$ inches On the following day the apparatus was applied, with 7 pounds attached to the cord, which was increased to 10 pounds on the 5th March

March 18th On the 18th day, patient progressing very favorably, and has half an inch shortening of his limb

April 12th Union firm Shortening scarcely half an inch Left off apparatus

Case 16 Thomas Irvine, aged 31 years, Ireland, bricklayer Admitted March 8, 1861, into Ward No 3, 1st Surgical Division N Y Hospital, under Dr T M Halsted, with fracture of left femur, at the junction of the middle and lower third of the limb Shortening 2 inches The injury happened a short time before admission

The limb was placed without delay on the double inclined plane, and the day after put up in the weight and pulley apparatus, 9 pounds attached to the extending cord

On the fourth day the weight increased to 12 pounds

March 20th On the 12th day, the shortening is still $1\frac{1}{4}$ inches

Patient states that when 18 years old he sustained a severe injury of the left hip-joint that confined him for several months and left a permanent shortening of the limb, but to what extent he cannot tell

April 13th Union is firm Shortening remains the same

Case 17 Ann Gorman, aged 58 years, Ireland Admitted March 9, 1861, to Ward No 2, 1st Surgical Division, N Y Hospital, under Dr T M Halsted, with impacted fracture of cervix of right femur, from a fall on the trochanter Rotation of the thigh outward, impossibility of rotating it inward, pain in the region of trochanter, shortening of $1\frac{1}{4}$ inches, are (p 246) the significant indications of this fracture, notwithstanding the absence of crepitus The weight and pulley apparatus applied and six pounds attached Diminishing the shortening of the limb is not attempted in this case, serious consequences might result from disturbing the injured parts so near the joint Our aim is to afford steady support to the muscles, and maintain the

parts in a state of rest This is being accomplished with much comfort to the patient, who sits up when disposed to do so

April 12th Patient is doing well

Case 18 Wm White, 6 years, New York, admitted into St Luke's Hospital, Feb 28th, 1861, under the care of Dr Bumstead, with fracture of the right femur, a little below its middle, happening the day before Shortening of $1\frac{1}{2}$ inches

After being put up in the apparatus, with four pounds weight attached, the shortening of the limb was reduced to half an inch

March 20th Three weeks after the accident, shortening less than half an inch The little patient sustains the treatment very comfortably

April 13th No shortening Left off apparatus

In addition to the foregoing cases that came under my own personal observation, Dr Jas M Minor, of Brooklyn, has kindly furnished me three cases treated under his direction and supervision, by Dr Parish, Resident Surgeon in the Brooklyn City Hospital

Case 19 Michael Henry, Ireland, æt 64, laborer, admitted January 1st, 1861, with extra capsular fracture of right femur Shortening at time of admission, $1\frac{1}{4}$ inches Treated according to Dr Buck's plan Weight used for first five weeks, about 12 pounds Reduced after that time to 6 pounds Discharged March 5th, 1861, with $\frac{1}{4}$ inch shortening Patient allowed to sit up in bed at all stages of treatment

Case 20 James Johnson, Ireland, æt 55, laborer, admitted December 17, 1860, with fracture of right femur at about its middle, at which point it had been fractured twenty years before, resulting in a shortening of $1\frac{1}{2}$ inches Treated for first four weeks with the Burge apparatus, during the remainder of the treatment, with the weight and pulley,—the union at the (p 247) time being incomplete, and the shortening $1\frac{1}{2}$ inches (the same as previous to the last fracture)

Shortening at date of admission, $2\frac{1}{4}$ inches

Discharged with firm union on the 1st of March, 1861 Shortening, $1\frac{3}{8}$ inches, a gain of $\frac{1}{8}$ of an inch upon length of limb previous to last fracture Weight used, 14 pounds

Case 21 Thos Healy, Ireland, æt 40, laborer, admitted Feb 1st, 1861, with fracture of middle of left femur Shortening, at date of admission, $1\frac{1}{2}$ inches Treated according to Dr Buck's plan Weight used, 12 pounds, reduced after five weeks to about 8 pounds Apparatus still on (March 15) Present shortening about $\frac{1}{8}$ of an inch

RECAPITULATION

Of the twenty-one cases described, fifteen were males, and six females

Age—The extremes were twenty-one months and sixty-four years

Three were under six years Two were twelve years old Six over twelve and under twenty-five years Ten were between thirty-one and sixty-four years Three of the female patients were very fleshy persons

Seat of Fracture—Two were impacted fractures of the cervix Two fractured within 2 inches of the trochanter, and below the cervix

Two within 2 or 3 inches of the condyles

Eleven near the middle of the shaft

Four near the junction of the middle and lower third of the shaft

Shortening—The extremes of shortening immediately resulting from the injury were $\frac{3}{4}$ of an inch and 3 inches, the average an inch and a half

These cases, though limited in number, embrace a sufficient variety of age, sex, and other conditions, to test fairly the method of treatment To decide this question, let us now look at the results Of these results certainly the most important (p 248) is the restoration of the limb to its original length How far has this been attained?

Two of our cases must be excluded from this estimate—one, No 20, on account of a previous fracture of the same bone, that had left a degree of shortening not ascertainable with certainty, the other, No 16, on account of previous shortening produced by disease of the hip-joint, consequent upon injury in youth

The results in the remaining nineteen cases were as follows —

The three children under six years of age recovered without any perceptible shortening

The two children 12 years old had each half an inch shortening. Excluding from the remaining fourteen cases the two of fractured cervix, we have twelve cases of fracture of the shaft of the femur in adults, of which Case No 11 recovered without any shortening, No 21 with $\frac{1}{8}$ of an inch, and No 14 with $\frac{1}{4}$ of an inch shortening. The maximum of shortening was a full inch, and that in one case only, No 12, a refractory patient. The average shortening of the entire twelve cases was a fraction less than half an inch.

In no instance did excoriations or other lesions occur under the treatment.

These results will compare favorably with those obtained by other methods of treating this injury.

Further important advantages deserve to be mentioned.

Extension, maintained as it is by a weight and pulley, with an elastic band interposed, is continuous and self-sustaining, constantly antagonizing the contraction of the muscles, thereby preventing the rough extremities of the bone fragments fretting the soft parts. If applied immediately after the injury, as it may be, the spasmodic twitchings, which are so excruciating, are prevented, and the patient made comfortable from the outset. Its efficiency was fully tested in case No 8, where a fracture had occurred on board ship, and had united firmly with $2\frac{1}{4}$ inches shortening. At the expiration of six weeks, the refractured bone was treated *de novo*, with a final result of only half an inch shortening. This result was the best that had (p 249) ever been obtained in an adult after refracture in the practice of the New York Hospital.

Counter-extension by this method is not sustained solely by the perineum through the medium of the perineal band, as is the case where the long outside splint is used, but is shared by the weight of the body, which, under certain circumstances, may present sufficient resistance to the extending force, and permit the perineal band to be dispensed with altogether. The accomplishment of this object is further aided by elevating

the foot of the bedstead a few inches. The advantage of thus relieving the perineum is especially illustrated in the treatment of heavy female patients and young children.

Not the least important advantage of our method is its simplicity and economy. The several articles employed can be procured under any circumstances, at an expense of a few shillings. The adhesive plaster is the most indispensable item, the pulley and perineum band might be extemporized in various ways that would suggest themselves to an inventive surgeon.

The limb once put up, the design of the treatment can easily be comprehended, and the co-operation of any intelligent attendant made available in carrying out the surgeon's plan in his absence—an advantage which every country practitioner will appreciate. Our experienced and intelligent nurses at the hospital all testify to the comfort enjoyed by patients under this treatment, and the facility with which it is carried out. The treatment of compound fractures of the thigh by the same method, it is believed, will be attended with great advantages.

A patient is now under treatment for this injury in the N. Y. Hospital, and well advanced in recovery.

Our experience in this case also has been quite satisfactory.

THE END

BUCK'S FASCIA

Dr Gurdon Buck was able to retrieve a kernel of anatomic information because he knew thoroughly the backgrounds of anatomy and performed his daily surgical work at the New York Hospital with an open receptive mind. He sought to explain variations in behavior of clinical cases on an anatomic basis and thus, in the case of the genito-urinary organs, he identified an undescribed fascia which still bears his name. We must marvel at his detailed information of the anatomy of the genito-urinary organs and his knowledge of the original descriptions of the anatomy of those parts of the body as written by earlier anatomists and surgeons. Buck refers to the work of Velpeau, T. Morton, Colles, Malgaigne and others.

The clinical application of an understanding of this fascia of the penis was the important thing to Buck. He was not describing a newly found anatomic feature for the sake of putting himself in the literature but because he wanted other doctors to have an explanation of certain urinary extravasations. The term Buck's fascia is valuable and should be more widely known.

H. Young in *Practice of Urology*, Phila., Saunders, 1926, Vol. 1, pp. 156-157 gives a clear description of Buck's fascia with illustration and its relation to Colles' and Scarpa's fascia. An illustration and account is also in Nelson's *Surgery*, N. Y., 1928, Vol. 6, pp. 45-46. An excellent complete paper, *The clinical importance of Buck's and Colles' fasciae*, by M. B. Wesson is in *Surg., Gynec. & Obst.*, 44, 208-213, 1927.



Buck's Fascia

A New Feature in the Anatomical Structure of the
Genito-Urinary Organs Not Hitherto Described

BY

GURDON BUCK, JR, M D

Surgeon to the New York Hospital, &c &c

Illustrated with a plate

Published in The Transactions of the American Medical Association, 1 367-371, 1848



HERE is scarcely any anatomical division of the human body which has been more thoroughly studied than the Genito-Urinary Organs in the male, and particularly within a recent period

So minute have been the investigations of living anatomists, that it would hardly seem possible that anything should have escaped their notice, and remain to be brought to our knowledge at the present day, especially such an anatomical feature as the one to which this communication is intended to invite attention

It is now at least five years since it first attracted my notice while engaged in dissections preparatory to a course of lectures on Surgical Anatomy at the New York Hospital, and from that time to the present it has been demonstrated every year to the class attending the spring course at that institution

At the close of the college session in the spring of 1846, an opportunity was offered me, through the kindness of my friend, Professor Watts, of the College of Physicians and Surgeons, in the city of New York, of exhibiting this structure to his anatomical class

If the dignity of a new discovery cannot be claimed in the present instance, it will, perhaps, be conceded that parts already only partially known, are now exhibited in new relations not hitherto described, and possessing a real interest from their practical bearings

The anatomical structure in question consists of a distinct membranous sheath investing the penis in the manner to be described, and forming a continuation of the suspensory ligament above, and of the perineal fascia below, and will be best understood by a description of the mode of dissecting it

The penis and scrotum are to be circumscribed by an incision at the distance of three fingers breadth all around, and crossing the perineum at the anterior margin of the sphincter

(p 368) The dissection of the skin and subjacent cellular and adipose tissues is to be made towards the penis, on the level of the fascia lata laterally, and of the perineal fascia posteriorly, and carefully continued to the body of the penis, as far as the corona glandis By this means, the penis, as well as the suspensory ligament, is denuded of its loose movable investments

An incision is then to be made along the dorsum of the penis, exactly in the median line, splitting through the suspensory ligament, and extending forward to the corona, between the dorsal vessels and nerves that run parallel on either side The adhesions of the sheath along the dorsum are firm, and require careful dissection, the blood-vessels and nerves being raised with it, serve as a guide to show the line of adhesion

This dissection being prosecuted laterally as well as inferiorly and at the extremity, the entire corpus cavernosum is enucleated, the muscles of the perineum being raised with the sheath It is now clearly seen that the suspensory ligament from above, and the perineal fascia from below and laterally, form one continuous membrane with the sheath, inclosing the corpus cavernosum in its cavity, and embracing the corpus spongiosum urethræ between two layers, one of which passes above, and the other below it The excavated base of the glans adheres inseparably to the outer surface of the sheath, while, by means of its inner surface, it caps the summit of the corpus cavernosum

Its adhesions are most firm at the extremity of the corpus

cavernosum, along its dorsal surface, and at the insertions of the erector and accelerator muscles

It is thickest around the corona, along the dorsal surface, and where it forms the suspensory ligament

Zones of vessels run at regular intervals in the direction of the circumference of the penis, from the dorsal trunks to the corpus spongiosum, between the layers of the sheath

The cavity formed by the sheath, and occupied by the corpus cavernosum, is limited posteriorly by the triangular ligament

That portion which covers the perineal muscles, and has been described by authors under the names of the superficial fascia of the perineum, inferior fascia and ano penic fascia, arises laterally from the ascending ramus of the ischium, and descending of the pubes, as far forward as the inferior edge of the symphysis, where the two layers meet and form the suspensory ligament. Posteriorly, it is (p 369) continued over the transverse muscles, and folding around their edges is prolonged upwards into the ischio-rectal fossa

It also sends off, from its upper surface, membranous septa between the accelerator muscles in the middle, and the erectors on either side, to join the triangular ligament, and thus forms three distinct and independent sheaths that are confounded anteriorly with the common sheath investing the corpus cavernosum

M Velpeau's description of this fascia (*Traité d' Anatomie Chir*, 3me edit Paris, 1837, tome II p 214) is the most minute and accurate. He says of it, in addition to the above—"that it is insensibly lost in front upon the body of the penis." Mr T Morton (in his *Treatise on the Surgical Anatomy of the Perineum*, London, 1838, p 12) says of it, that—"anteriorly it passes forwards into the scrotum, where it appears to become continuous with the dartos."

Colles, who has given the most accurate description of the sheath of the penis (in his *Treatise on Surgical Anatomy*, 2d Amer edit, Phila, 1831, p 146) says—"on raising the skin we find a ligamentous membrane which invests the penis, and which is derived from the suspensory ligament" further on he adds—"This ligament, adhering by its upper edge to the sym-

physis pubis, descends and fixes itself by its lower edge to the dorsum penis, but it does not cease here, for it can be traced, expanding itself over the crura of the penis and urethra, until it terminates at the base of the glans, thus constituting one of the envelopes of the penis ”

Other modern anatomists, such as Malgaigne, Cruveilhier, A Berard, &c, have contributed nothing to render our knowledge of these parts more complete than the authorities just quoted

The present statement, besides embracing what has been described by Velpeau and Colles, shows the peculiar relations of this sheath to the corpus spongiosum urethræ and the glans penis, which, so far as my researches have extended, have not hitherto been described by anatomists

Important pathological relations have been shown by Velpeau to depend on the peculiar structure of these parts as described by himself, especially in the formation of abscesses, and extravasation of urine anterior to the triangular ligament The more complete development of their anatomical relations set forth in this paper, serves to confirm these pathological views, and throw additional light upon them

The following case of extravasation affords a good illustration (p 370) CASE I—Charles Peak, a seaman, aged thirty-four years, born in England, was admitted into the New York Hospital, February 29th, 1848, with a circumscribed, hard, prominent swelling, of the size of a Madeira nut, in the anterior part of the scrotum, covering and closely embracing the urethra, and also extending on either side around the root of the penis, in the form of an indurated flattened band

It was very tender to the touch, and contained matter, as was evident from deep fluctuation The superjacent cellular tissue and scrotum retained their natural suppleness and mobility, and did not participate at all in the deep inflammation A stricture of the urethra, admitting only the smallest sized bougie, was found within the swelling, and had existed for more than a year

About three weeks before admission, the swelling in the scrotum first appeared of the size of the end of the finger, after the introduction of a wire sound by the patient himself

A deep free incision into the tumour evacuated a quantity of fetid urine mixed with pus, and for some time subsequent, urine continued to escape through the wound, in small quantities

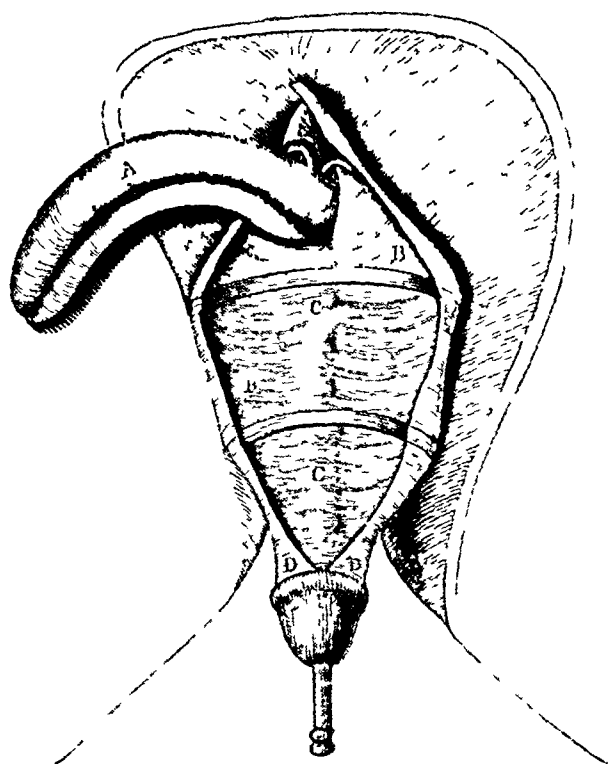
In this instance, the rupture of the urethra had taken place within the sheath of the corpus cavernosum at the stricture, and the inflammatory swelling consequent on the extravasation of urine was thus confined to the narrow limits described, the communication between the urethra and loose superjacent cellular tissue being shut off

Left to itself, the swelling sometimes gradually approaches the surface, by appropriating to itself, by the adhesive inflammation, the successive layers of cellular tissue covering it, and at length evacuating its contents externally, through an ulcerated opening. This, however, is not uniformly the case. It often happens that the ulcerative process within the abscess goes on in advance of the adhesive and conservative process on the outside, and opens a communication into the loose cellular tissue covering it, the consequence of which is rapid extravasation in every direction, filling up the scrotum, spreading up over the pubes, and sometimes extending along the crest of the ilium as high as the false ribs. It is probably rare that this extensive secondary form of extravasation is not preceded by the circumscribed or primary form, hence the importance of the established rule of practice, to make a free opening into these hard swellings along the urethra, as soon as their existence is ascertained

(p 371) Another, and much more rare consequence of an opening of the urethra into the sheath, is the gradual formation of one or more fistulous tracks along the penis, terminating behind the corona glandis, and causing a good deal of thickening and induration of the tissues along their course

Other pathological and physiological relations will doubtless be deduced from this anatomical structure, when attention shall be more extensively directed to it

The accompanying drawing, representing the dissection of the sheath of the penis, was made by my pupil, Mr Moreau Morris



EXPLANATION OF PLATE

A dissection of the sheath of the penis, showing,

A The corpus cavernosum, enucleated from the sheath

B The sheath, split up through the suspensory ligament, of which it is a continuation

C The relations of the sheath to the corpus spongiosum urethrae, one layer of which passes above, the other below it

D Its relations to the glans penis, to which the sheath adheres inseparably by its outer surface, while by its inner surface it caps the corpus cavernosum

E The dorsal arteries, veins and nerves, raised with the sheath

BUCK'S OPERATION

Dr. Gurdon Buck was a pioneer in surgery of the bones and joints as well as in treatment of fractures, for which he is chiefly remembered. When a patient with a knee ankylosed to a right angle for several years presented himself in 1844, Buck recalled an operation by John Rhea Barton 9 years previously and decided to adapt the procedure to suit his needs. We thus see that Buck kept himself informed of the work of other surgeons and was alive to use and improve their methods. Barton had removed a wedge-shaped portion of bone from the femur and straightened the leg, Buck proposed to excise such a wedge-shaped portion of the knee joint itself.

The operation was performed without benefit of asepsis or anesthesia¹. The patient recovered with a well functioning leg.

The original description on the following pages should be read because of its picture of surgery 90 years ago and because it is a landmark in the surgery of bones and joints from which modern orthopedists have advanced.



Buck's Operation

The Knee-Joint Anchylosed at a Right Angle—Restored Nearly to a Straight Position after the Excision of a Wedge-Shaped Portion of Bone, Consisting of the Patella, Condyles and Articular Surface of the Tibia

BY

GURDON BUCK, M D

One of the Surgeons to the New York Hospital

Published in the American Journal of the Medical Sciences, n s 10 277-284, 1845

WILLIAM KEITH, a farmer, of healthy and robust constitution, aged 22 years, born in Canada, was admitted September 12th, into ward No 7, north building, New York Hospital, with the right knee anchylosed at a right angle, in consequence of a violent inflammation and suppuration of the joint, produced by a wound inflicted seven years previous with an axe, that had grazed the bone over the inner condyle, and was followed by a confinement of seven months to the house, the limb continuing in the deformed position already noticed

The joint was immovable though the patient imagined he was able to produce a slight degree of motion. The condyles of the femur were prominent, and stood in advance of the tuberosity of the tibia with the patella deeply and immovably imbedded between them. An irregular bony projection was observed over the inner condyle where an extensive scar marked the situation of the original wound. Several other scars of

openings were visible from which matter had been discharged in the progress of the inflammation consequent on the injury, for instance, one on either side in the ham and three on the anterior and lateral surfaces above the condyles. The tendons in the ham stood out in prominent relief from the limb. The skin and subjacent soft tissues enveloping the joint were supple and healthy. Since his recovery from the effects of the injury, the patient had enjoyed (p. 278) uninterrupted good health, and had been free from pain or tenderness in the knee, he had been accustomed to walk with one crutch, though sometimes he dispensed with it and stooped to accommodate himself to the shortened condition of his limb. The deformed limb was shorter and in every respect less developed than its fellow.

It was explained to the patient that from the condition of the joint, the limb did not admit of being improved in its position, by any ordinary surgical operation, but that in a few similar cases, an extraordinary operation consisting in removing a wedge-shaped portion of bone from the femur above the condyles had been resorted to with favourable results.

There being some weighty objections to this operation, it was proposed to modify it in its application to his case, and as the joint itself no longer existed in its normal condition, with secreting articular surfaces, it was judged equally safe to perform a similar operation upon the parts pertaining to the joint which, to all appearance, were free from disease.

The advantages contemplated by this modification were that more extensive surfaces of contact for bony union would be obtained, and greater strength of limb secured with less remaining deformity than was practicable in the operation of Dr J. Rhea Barton, of Philadelphia, already alluded to.

The patient was fully apprised of the serious nature of the proposed operation, and the dangers incident to it.

Being, however, exceedingly desirous of relief from his deformity, he decided after a few days' reflection, to submit to it. It was accordingly performed with the concurrence and aid of the other surgeons of the hospital, the 12th day of October, 1844, as follows —

Operation —Preparatory to the operation, the tendons of the biceps, semi-tendinosus, semi-membranosus and gracilis muscles had been divided five days before, in the usual manner, by two subcutaneous incisions, in doing which the peroneal nerve was unintentionally cut across and was followed by numbness and pain extending to the foot, the punctures, however, had healed and no inflammation remained in the ham

The tourniquet having been applied to the upper part of the thigh, an incision was made from the outer to the inner condyle, across the middle of the patella, and a second incision from the middle of this, perpendicularly downwards to the tuberosity of the tibia. The included angles of integument were dissected down to a finger's breadth below and parallel with the margin of the articular surface of the tibia. The ligamentum patellæ and the fibro-ligamentous tissues on either side were cut through on the same level to the extent of nearly two-thirds of the circumference of the bone. With the amputating saw a section of the tibia was made at three-fourths of an inch below the joint anteriorly and directed with a slight obliquity upwards so as to terminate at the margin of the articular surface posteriorly. Two-thirds of this section was accomplished with the amputating saw. The (p 279) second section was then commenced through the upper part of the patella, parallel with the first, and on a plane forming an angle with it, less than a right angle, and continued to about the same extent as in the first section with the same saw. The remainder of the section through the tibia, as well as through the condyles, was completed with a metacarpal saw and chisels. The included wedge-shaped portion of bone being removed, it was found the section had not been carried far enough backwards, the posterior portion of the condyles still remaining consolidated with the tibia.

To include this a new section was undertaken, commencing upon the cut surface of the femur, three-fourths of an inch anterior to the angle at which the sections already made met, and directed backwards and upwards on a plane more oblique in reference to the axis of the femur. This new section being removed, the remaining points of connection were ruptured by

cautiously flexing the leg on the thigh, after which the irregular prominences were pared away with the bone forceps. An attempt was now made to extend the leg upon the thigh, when it was found that the bony surfaces could only be brought to within a finger's breadth of each other anteriorly. The soft parts in the ham being rendered tense and opposing great resistance to the extension, the attachments of the ligaments were dissected up posteriorly from the tibia while the leg was held in a state of extreme flexion, and, in addition to this, a further section of five-eighths of an inch thick was removed from the anterior two-thirds of the femur.

The leg could now be extended to the required degree with the bony surfaces in contact at every point, and the soft parts posterior to the joint in such a state of tension as to give steadiness and solidity to the coaptation.

The section of the condyles exceeding that of the tibia in its antero-posterior diameter, caused an overlapping in front of about half an inch. The hemorrhage was very moderate and only two ligatures were required to small branches given off by the popliteal trunk. The soft parts posterior to the joint and separating it from the artery were very little disturbed. The angular flaps of integument being redundant in the new position of the limb, were pared away to the required extent and secured in contact by seven sutures. The limb was then placed on an inclined plane with a slight angle at the knee, and after the patient was removed to his ward, adhesive straps were applied between the sutures and a compress of dry lint laid loosely over the whole.

The operation exclusive of the dressings occupied 40 minutes, and though very painful, was borne with remarkable fortitude.

At evening patient had felt somewhat chilly, and on moving his arms experienced twitchings in his limbs, the knee was becoming painful, pulse scarcely accelerated, a pretty copious oozing of blood from the wound was taking place. Ordered flaxseed poultice and tinct opii gutt xl, pro haustu.

(p 280) *October 13th*—Passed a very comfortable night and slept after midnight, chilliness continues, pulse 112, tongue but

little changed, occasional twitchings continue and pain in the joint increases, oozing nearly ceased, scarcely any swelling has taken place, temperature moderately increased

At 6 P M —Febrile reaction was fully established, pulse 120 Twenty-four leeches have been applied around the knee, and are bleeding freely Ordered tinct opii gutt xl, at bed time, and to be repeated at midnight if necessary

14th —Patient more comfortable, passed pretty good night after midnight, pain in the knee very much diminished, twitchings not increased, pulse 108, countenance good, has tenderness and swelling of the lymphatic glands in the groin, ordered cold water dressing

At 6 P M —Pain in the knee had again increased, pulse 120, with pain in the head and back, bowels confined, ordered 6 leeches to the groin and 18 to the knee around the condyles R —Ant tart gr j, infus sennæ comp ℥viij Dose ℥j every two hours

15th —Disturbed night, pain in the bowels and back, knee much easier, twitchings abated, tenderness in the groin diminished, pulse 108, tongue coated with yellowish fur in middle, knee moderately swollen without redness, only one evacuation from bowels, ordered laxative enema

At 6 P M —Complained of bowels and back, pulse 108 Ordered enema of starch with tinct opii ℥j

16th —Passed a good night Bowels easy, pulse 100, changed adhesive straps and found wound looking well without any appearance of erysipelas, suppuration commencing, at evening pain in abdomen increased No pain in the knee, pulse 98 R —Starch enema, with tinct opii ℥i Poultrice to abdomen

17th —Quite free from pain, pulse 96, suppuration increasing, apply poultice to knee

18th —A disturbed night from griping pains in the bowels and twitchings of the limb, pain of limb referred to knee and instep, pulse 92, swelling and redness of knee moderate

20th —Progress favourable, pulse 92, allowed more nourishing diet, oysters, &c, removed the last sutures

23^d —General condition continues favourable, twitchings of the muscles are the greatest source of suffering, they are not con-

fined to the limb, but extend to other parts of the body, two or three times they have attacked the bowels with great violence. Some displacement has been the consequence, so that the anterior edges of the condyles of the femur are about an inch in advance of the tibia, pulse 88, appetite good, tongue clean, bowels confined, suppuration moderate and healthy, edges of wound cicatrizing except at the angles of the wound over the condyles. Take sol sulph morph gutt xv, aquæ menth pip ʒss at bed time, and repeat, if necessary, ol ricini ʒi

(p 281) *Nov 1st*—Progress for the most part favourable, at times, pain in the knee is very severe, twitchings continue, but in a less degree, position of limb improved, less riding of the excised ends of the bones past each other, discharge from outer angle of wound copious

Dec 9th—Wound has been healed for more than a week, pain and twitchings after diminishing gradually, have now entirely ceased. Union is taking place between the bones, a slight degree of motion only is perceptible, patient's general health, after suffering considerably from protracted pain, privation of rest, &c, has been steadily improving for some time past, pulse 90, tongue clean, appetite good, bowels regular, rests well at night with only an occasional anodyne. For the relief of the twitchings from which patient suffered so much, anodynes were the most effectual remedies. Solution of sulph morphium was given in 15 drop doses, twice repeated at bed time, besides which he took a mixture containing $7\frac{1}{2}$ drops at a dose, at discretion, when his sufferings rendered it necessary. The limb throughout the treatment was supported on a double inclined plane, with lateral splints and pads above and below the knee.

Patient left his bed the first week in January, with the limb supported in the apparatus that is used for forcible extension of the knee joint. At this time a slight degree of motion in the direction of flexion and extension was still perceptible, but none in a lateral direction. He was soon able to support himself on crutches and placed his foot on the floor, and, after a while, left off the apparatus and only applied a bandage. As the patient's general health improved he acquired strength in his limb, so that for two or three weeks preceding his discharge, he walked about

the hospital grounds with the aid of a cane only. The difference in the length of the two limbs was compensated for by a stirrup-shaped frame secured to the sole of his boot by means of an iron plate. The bony union at the knee had become firm without any perceptible motion, and the cicatrix of the skin as well as the subjacent tissues was supple and movable. The only uneasiness felt from exercising was referred to the calf of the leg and instep. The difference in the length of the limbs was about 5 inches, at the heel of which not more than one-half could be ascribed to the operation, the remainder depending on defective growth in the limb subsequent to the inflammation of the joint.

On the 22d of April last, patient took his discharge, to return home to Canada near Niagara Falls, well pleased with the improved condition of his limb.

Three days before leaving the hospital he walked a distance of two miles with the aid of a cane only, and without pain or unusual fatigue. The accompanying drawings taken from plaster models, show the condition of the limb before the operation, (*see fig 1*), and at the time the patient left hospital, (*see fig 2*). The full length view (*fig 3*), is from a (p 282) Daguerreo type taken three days before his discharge. The models have been deposited in the Museum of the University of Pennsylvania, as well as the pathological museum of the New York Hospital.

Description of the excised bones —The inferior two-thirds of the patella had been removed by an oblique cut from above downwards and from before backwards, and was found consolidated with the outer condyle by bony growth without any trace of the line of junction. It was adherent to the inner condyle by condensed cellular tissue. Both condyles were buried into and consolidated with the articular surface of the tibia.

The cut surface of the condyles, for the most part, presented a compact eburnated texture with only slight remains of cellular tissue interspersed. The space between the patella and tibia and behind the ligamentum patellæ was filled with condensed adipose and fibrous tissue.

(p 283) No vestiges remained of cartilage or synovial membrane.

The cut surface of the tibia presented its normal cellular tex-

ture, except a single large cell capable of holding a filbert near the outer edge of the bone and having for its upper wall the thin compact shell of the articular surface. The section of the patella was also of normal cellular texture, with a similar large cell of three-eighths by three-fourths of an inch in extent. A third and much larger cell capable of containing a hickory nut, occupied the inner condyle near its articular surface. These cells were lined with a thin reddish membrane and contained an oily and fatty matter of reddish colour. Another incomplete cell was also found in the outer condyle, intersected with septa, subdividing it into smaller compartments lined and filled like the rest, none of these cells perforated the outer shell of bone, though at some points they approached very near it.

Subsequent, long-continued maceration separated the several parts from each other.

Remarks—Though this operation was severe and protracted, the subsequent inflammation and suppuration were by no means excessive, and were confined to the parts immediately involved without spreading to a distance. Primary union of the edges of the wound took place to as great an extent as was desirable, openings remaining over the condyles at the extremities and in the middle of the transverse incision for the discharge of matter. At one time a small opening formed posteriorly in the ham, and after discharging a few days, closed spontaneously, with this exception, there was no burrowing of matter between the muscles, and at no time did the discharge exceed two ounces in 24 hours.

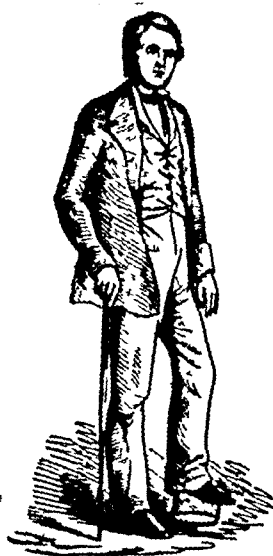
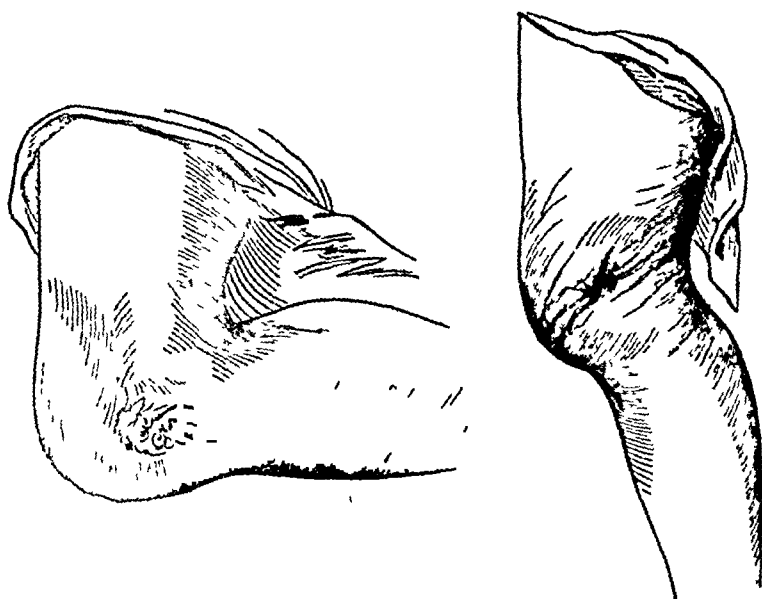
It had been my aim in the operation to disturb as little as possible the soft parts beyond the limits of the joint, especially those posterior to it, so as not to establish any direct communication between the wound and the loose intermuscular cellular tissue by which inflammation is so readily propagated. The long continuance of the pain in the knee and the twitchings, notwithstanding the generally favourable aspect of the parts themselves, were the principal cause of solicitude in this case.

Though the patient's condition at no time could be viewed as critical, yet his protracted sufferings, mitigated only without being controlled by anodynes, necessarily kept alive apprehen-

sions as to the ultimate result It may be reasonably questioned whether these painful symptoms were necessarily chargeable upon this operation or were not rather to be attributed to certain peculiarities in this case that might be avoided in another For instance, the division of the peroneal nerve in the section of the tendons and the subsequent stretching of its recent cicatrix, together with the general state of tension of all the tissues in the ham produced by the altered position of the limb This is more probable, from the fact that the patient complained of pain along the course of the peroneal nerve, and of twitchings of the posterior muscles of the limbs as more severe than elsewhere In (p 284) concluding this report it is due to Drs Cook and Jones, the resident surgeons who successively had charge of this patient, to express my indebtedness for their efficient co-operation in the treatment of his case, the favourable result of which, is in no small degree to be attributed to their untiring patience and devotedness

NEW YORK, *May* 31st, 1845

THE END



* [In the Daguerrotype from which this wood cut was engraved, the figure was reversed, which was not observed by the Editor until the engraving was finished—Ed]

MEDICAL CLASSICS

VOL 3

May, 1939

NO 9



CONTENTS

Portrait of Peter Ludwig Panum - - - - -	802
Peter Ludwig Panum - - - - -	803
Biography - - - - -	803
Bibliography - - - - -	804
About Peter Ludwig Panum - - - - -	821
Index to Bibliography - - - - -	824
Introduction - - - - -	826
Iagttagelser, anstillede under Maeslinge-Epidemien paa Faeroerne i Aaret 1846 (Observations made dur- ing the epidemic of measles on the Faroe Islands in the year 1846) Peter Ludwig Panum - - -	829



PETER LUDVIG PANUM (1820-1885)

Reproduced through the kindness of Dr V Meisen, Copenhagen

Bulletin of the Institute of the History of Medicine, 2 opp 259, 1934

MEDICAL CLASSICS

VOL 3

May, 1939

NO 9



Peter Ludwig Panum

Biography

- 1820 Born December 19, in Rønne on the island of Bornholm, almost a hundred miles southeast of Copenhagen His father, Jens Sévérin Nathanael Panum, was a regimental surgeon at Rønne
- 1828 Age 8 The Panum family moved to Rendsburg Schleswig-Holstein, where the father was a surgeon to the Holstein artillery for one year and then a director of the K Christians-Pflegehaus of Eckernforde, Schleswig-Holstein Peter began his academic work at the University in Eckernforde
- 1840 Age 20 Admitted to the University of Kiel.
- 1841 Age 21 Matriculated in medicine at the University of Copenhagen
- 1845 Age 25 Qualified as a doctor of medicine
- 1846 Age 26 While an interne, actually just before his twenty-sixth birthday, Panum was sent by the Danish Government to the Faroe Islands to investigate the epidemic of measles which attacked 6000 of the 8000 inhabitants and to give them medical aid
- 1847 Age 27 Panum published the results of his investigations in a classical contribution to medicine, herein reproduced Panum later studied in Berlin and published an abstract of his paper of 1847 in the first number of Virchow's Archiv (Virchow was then 26)
- 1848 Age 28 Panum continued his training at the Almindelig Hospital in Copenhagen but left to become a surgeon in the Danish Navy during the Danish-German war

- 1850 Age 30 Sent by the Danish Government to study the cholera epidemic at Bandolm on the island of Laaland, about seventy-five miles from Copenhagen
- 1851 Age 31 Received the M D degree from the University of Copenhagen after defending his thesis on fibrin
- 1852 Age 32 Studied at Wurzburg under Virchow, von Kölliker and Scherer, at Leipzig under K G Lehmann and at Paris under Wurtz and as an assistant to Claude Bernard
- 1854 Age 34 On returning to Denmark, Panum was appointed Professor of Physiology, Medical Chemistry and General Pathology at the University of Kiel
- 1864 Age 44 Panum resigned his chair at Kiel to become a successor to Eschricht at the University of Copenhagen and there was instrumental in establishing a suitable laboratory
- 1884 Age 64 Chief organizer and President of the Eighth International Medical Congress which convened at Copenhagen
- 1885 Age 65 Died on May 2, of coronary sclerosis with occlusion and rupture of the myocardium

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¹ Adapted, with permission, from the excellent bibliography by William M Gafar, published in the Bulletin of the Institute of the History of Medicine, 2 264-280, 1934. The following abbreviations are used British—British and Foreign Medico-Chirurgical Review Canstatt—Jahresbericht über die Fortschritte der gesamten Medicin in allen Ländern Centralbl—Centralblatt für die medicinischen Wissenschaften Schmidt—Jahrbücher der in und ausländischen gesamten Medicin Virchow-Hirsch—Jahresbericht über die Leistungen und Fortschritte in der gesamten Medicin Unqualified second and subsequent citations contain abstracts, reviews or notices on the paper or book which they follow

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Abbés Refraktometer	97	1882
Animals, abuse of	82	1879
Artificial respiration	20	1856
Bernard, Claude, discoveries of	13	1853
	16	1855
Cholera	8	1850
Compressed air	47, 51	1866
Eggs, malformation in	32	1860
	33	1861
Embolism	17	1856
	35	1862
	40, 41	1864
Faroe Islands	2	1847
	10, 11	1852
	30	1860
Fat metamorphosis	19	1856
Fermentation	79	1876
Fibrin	9	1851
Food, nutritive value of	46	1866
	100	1884
Gastric fistulas	14	1855
	60	1871
Glycogen	44, 45	1866
Heart, duplication of the	29	1859
Heart, motions of	21	1857
Infection, putrid	18	1856
	66	1874

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Peter Ludwig Panum

825

Intestinal fistulas	103	1885
	109	1886
Malformations	54	1869
	80	1878
Measles	2, 3	1847
Medical studies	52, 53	1868
	59	1871
	62, 74	1873
Metabolism	55	1869
(Microscopy)	67	1874
Milk, artificial	7	1850
Milk, nutritive value of	99	1883
Monsters	77	1877
Ovulation	96	1882
Physiology, Handbook of	43	1865
Protein in serum	5, 6	1850
Sight	24	1858
	26, 27	1859
	34	1861
	72	1875
	76	1877
	81	1879
	104	1885
(Superfetation)	95	1882
Transfusion	37	1863
	38, 40	1864
	71, 73	1875
Urea, secretion of	68	1874
Urinary sediments	4	1848
Vivisection	83	1879

INTRODUCTION

In his twenty-sixth year, just after graduation from medical school and during his internship in Copenhagen, Peter Ludwig Panum was sent by the Danish Government in 1846 to the isolated Faroe Islands in the North Sea. There an epidemic of measles was assuming serious proportions. Panum was to give medical aid to the victims and especially to make a scientific study of the epidemiology of the disease.

Measles seems to have prevailed from earliest times, but credit is given to Rhazes, a physician in Bagdad in about 910 A. D., for separating this disease from small-pox with which it had been confused. Some believe that Rhazes considered measles to be a mild form of small-pox. Avicenna of Bagdad, in about the year 1000, also wrote on measles and the scientific term 'rubeola' was introduced by Latin translators of Avicenna's writings. It remained for the great English physician, Sydenham, in 1670, to so clearly describe all the manifestations of the disease as to definitely differentiate measles from small-pox for modern physicians.

Measles had not prevailed on the Faroes since 1781. The population was thus without an immunity to the disease. Because of the difficulty of intercourse between the mainland and the islands, between the separate islands and even between isolated districts on the same island, the region offered an excellent opportunity for scientific study of the epidemiological features of the disease. Panum made a detailed report of the geography and climate of the islands and was able to record travels made by the islanders because such movements of the population were relatively uncommon and were, therefore, events of importance in the people's lives. Panum's report of his experiences is not only a remarkable paper on the life of the Faroes but it is also a true scientific study of the contagious features of measles.

In this epidemic six thousand of the eight thousand inhabitants of the islands were ill with measles and one hundred and two people died as a result of the disease or its sequelae.

Panum's conclusions in regard to the contagium of measles are thus summarized by W. M. Gafaer in his translation of the abstract of Panum's work:

- (1) The contagium of measles may not cause disease phenomena for some time after its introduction into the organism. After an indefinite prodromal period the rash always appears on the thirteenth or fourteenth day after exposure.
- (2) Measles is very contagious during eruption and efflorescence. The possibility of infection remains dubious in the prodromal and desquamation stages.
- (3) There is no relation at all between cowpox and measles. Both may develop in the same person at the same time.
- (4) The conclusion that measles may occur twice in the same person

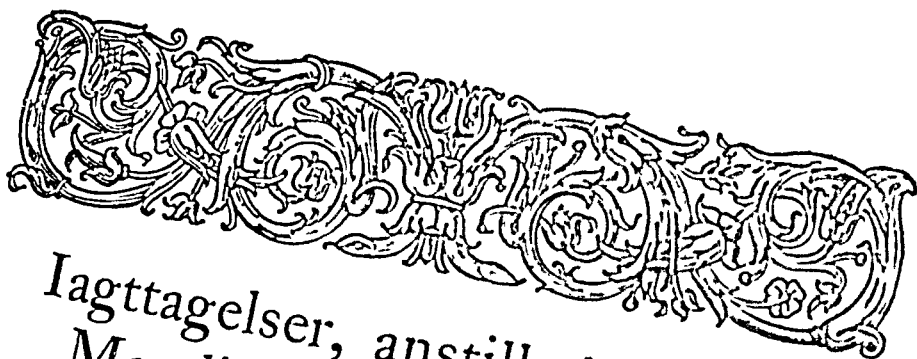
rests on an erroneous diagnosis, or at least such a case is very rare (5) Measles is not a miasmatic or miasmatic-contagious disease but a purely contagious one (6) Isolation is therefore the most certain means of arresting the progress of measles

Many other interesting facts were reported by Panum in this report. He was able to find twenty cases of syphilis which were directly attributable to one single case which had been observed two years previously. He found many cases of scabies, influenza, typhoid and typhus fever but practically no tuberculosis, no Bright's disease, no malaria, no scarlet fever and no whooping cough. He did not see a single patient with cancer. Panum was able to make some interesting observations on the control of small-pox on the islands and remarks that the disease had last prevailed in 1705.

After Panum returned to Copenhagen his recognition and progress were rapid. He became Professor of Physiology, Chemistry and General Pathology at Kiel and later at Copenhagen. He contributed many articles on subjects of physiology, public health, sanitation, pathological anatomy and dietetics, his papers on the experimental pathology of embolism, on the poisonous alkaloids and proteins and on the chemical products of putrefaction were especially valuable.

In 1884 he reached the zenith of his professional life when he was President of the International Medical Congress which met in Copenhagen. He was able to fill that chair with honor because he was a man of deep learning, great executive ability and, above all, a diplomat in all phases of professional and social life.

This reproduction of an English translation of Panum's paper is made through the kindness of Doctor Kenneth F. Maxcy of the School of Hygiene and Public Health of The Johns Hopkins University, of Doctor William Gafaeer, Senior Statistician of the United States Public Health Service, of Doctor R. R. Sayres, Senior Surgeon and Chief of the Division of Industrial Hygiene of the National Institute of Health, of Doctor Henry E. Sigerist of the Institute of the History of Medicine of The Johns Hopkins University and especially of my cousin, Doctor Edwin L. Crosby of the School of Hygiene and Public Health of The Johns Hopkins University who proposed Panum's paper as a valuable addition to MEDICAL CLASSICS.



Iagttagelser, anstillede under
Maeslinge-Epidemien paa
Faeroerne i Aaret 1846

(Observations made during the epidemic of measles on
the Faroe Islands in the year 1846)

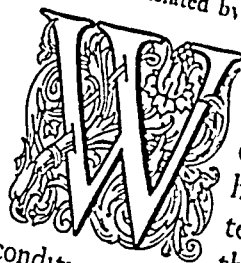
BY

PETER LUDWIG PANUM

Candidate in Medicine and Surgery

Bibliothek for Læger, Copenhagen, 3R, 1 270-377, 1847

Translated by Mrs A S Hatcher, United States Public Health Service



WHEN a physician is called to work in a place where climatic and dietetic conditions are different from those to which he has been accustomed, his first problem is to study the hygienic potentialities which affect the state of health of the inhabitants. It is, in fact, these hygienic conditions which contribute towards the development and frequency of some diseases and the improbability and rarity of others, and which more or less modify the symptoms of every disease, and it is indeed, on these conditions that the geography of disease, the special study of which subject will soon, perhaps, elevate it to the status of an independent science, is based. Since the outbreak of the measles provided the occasion for my journey to the Faroe Islands, it is natural that I directed my attention at once to the influence which the extremely peculiar hygienic conditions of the islands exerted upon this disease, and *vice versa*. But since, during my sojourn of almost five months

on the Faroes, I repeatedly traveled over the greater part of the islands, I was thus in a situation to make a great many observations in regard to the influence of the special hygienic conditions upon the state of health in general, as well as upon the frequency and development of the prevailing disease. To be able to give a complete nosography of the Faroes, a stay of several years would be necessary, what I here communicate consists of only some nosographic points and fragments, which may, perhaps, be interesting merely because so little is known about conditions on the Faroes in this respect.

I shall, then, try to set forth here the hygienic forces proceeding from the conditions on the islands, and as far as the observations I have been able to make permit me to do so, I shall attempt to show the influence which each of these forces in particular exerts on the state of health in general of the inhabitants, on the frequency, development, and method of propagation of the different diseases, together with the mortality rates of the country, which I shall also seek to illustrate further by statistical data collected during my sojourn on the islands. In another section I shall then present some observations in regard to the measles, inasmuch as they may be of general interest to the medical public.

If we first take under consideration the physical conditions of the Faroe Islands, we find them, as might be expected, quite individual.

The 17 inhabited islands, the largest of which is 8 square miles in size, the smallest about $\frac{1}{16}$ of a square mile, are separated by fjords, in which the "east fall" and "west fall" of the Atlantic Ocean—which are connected with the ebb and flood tides—produce in many places very powerful and dangerous currents. The islands consist of masses of volcanic mountains, which belong to the trap formation, and which rise to the height of one, two, or three thousand feet above the sea. Inward, towards the fjords, the land ascends in terraces, with grass-grown slopes, outward, towards the open sea, usually perpendicularly upwards.

The situation of the islands, out in the middle of the Atlantic Ocean, about 6 or 7 degrees farther north and 19 or 20 farther west than Copenhagen, in great part determines their climate.

In summer their average temperature was about 8°R , and it is probably usually between 7° and 8°R , often, however, the stoves are kept heated in mid-summer, the customs in this respect being governed entirely by the weather, which is very changeable. For two days during my stay we had 16° or 17°R , and at this temperature both the native-born people and the Government officials nearly perished with heat. While it is not so warm in summer on the Faroes as with us, in winter the cold, also is less rigid, but during the latter season, however, the humidity of the atmosphere often occasions the accumulation of considerable masses of snow, the rolling down of which in the form of avalanches does damage in many places. The winds are exceedingly uncertain and violent, calms and storms, which may overturn the houses, which make it necessary for the traveler to throw himself on the ground, in order not to be carried away,—indeed, which are able to move blocks of stone, occur now and again, by turns. Although I was not able to make hygrometric investigations, I may state with assurance that the humidity of the air on the Faroes is extremely great. The very high, often cone-shaped mountain tops are almost always, the lower regions, valleys, seacoasts, and fjords, very often, shrouded in masses of mist, pleasing in their shifting shapes, and clear air is rare. Because of the great humidity the standing of the barometer is usually low, indeed, not rarely points to earthquake without the occurrence of remarkable natural phenomena, for the same reason the grass is nearly always wet, and innumerable springs and rivulets leap down the sides of the mountains. The sea mists of the Faroe Islands seem to contain salt particles in pretty considerable quantities, this is clearly indicated by the salt crusts which, after a rather lengthy trip in a boat, especially in foggy weather, cover the face, even if the sea has been so quiet that not a splash has entered the boat, in unruly weather, moreover, the seawater that is churned up is conveyed in the form of rain over the surface of the sea, and its salty content then reddens the skin and often covers it with a quite thick deposit of salt. Thunder-storms are rare, but the aurora borealis often illumines the usually pitch-dark winter nights.

The vegetation of the country is limited to grass, small herbs, barley and potatoes. Trees or bushes do not thrive, frankly speaking, and even the efforts which certain government officials have made to promote, by the use of high enclosures, the fostering of currant and gooseberry bushes, willow and service-berry bushes, have not given any very cheering results. It seems to be less the temperature than the mists, blended with saline and other particles of sea-water, in conjunction with the powerful winds, that hinders their growth. The ocean washed ashore numerous species of sea-weeds, of which the hand-shaped weed, washed up in great quantities, deserves to be specially mentioned, because, in times of need, it is used for food.

The character of the Faroese landscape is about as different as possible from that of the pleasant Danish prospects. The inhabited places, which, without exception, lie close to the sea, are usually situated in valleys, which are enclosed on three sides by high mountains, terrace-shaped, or rising in even slopes, and which are open on the fourth side, and face the ocean. The flatter and lower parts of these valleys are tilled as fields, composed of small patches of ground, separated by furrows. These cultivated "home-fields," called "boe," bear partly excellent grass, partly barley or potatoes. Outside the enclosure which surrounds the "boe" up the mountains and among them, lie the hill-pastures, which include by far the greater part of the country, and where sheep and cattle go about at liberty. These pastures are covered everywhere with short but beautifully green mountain-grass, with the exception of the places (called "hammers") where the naked cliffs drop down perpendicularly, giving the mountains their terrace-shaped aspect, and of the mountain fissures and bare furrows formed by water courses and springs. Since, moreover, the houses are low, being constructed partly of wood, partly of earth and hard stone, and besides always thatched with green turf, and are scattered over the entire home-field, it may be supposed that the landscape, the chief beauty of which is its green color, is as a rule, neither very imposing nor pleasant looking. Only few of the inhabited places present, with the shapes of the mountains, or with views of other

islands or of colossal blocks of stone jutting out over the sea, or with waterfalls and lake-strewn plains, really attractive prospects, without, however, losing their stern, melancholy character. In the heart of the country, upon and among the mountains, the landscape bears everywhere, however diversified it may be, an extremely melancholy stamp. Above on the high plains often the eye reaches, within the limits of the horizon, only a level plain, almost bare of vegetation, strewn over with boulders of greatly varying sizes, and here and there, where the mists part for a moment, a distant, naked mountain-top. At other places in the interior of the country may be seen valleys, surrounded by mountains, partly bare, partly grass-grown, which sometimes conduct little rivers, sometimes enclose small lakes, and whose soil is usually a morass or peaty earth. Everywhere in these regions the deepest silence reigns, broken only by the murmuring tune of the streams and the calls of birds, whose melancholy, monotonous notes are in harmony with the sombre aspect of the entire landscape. The most pleasing and with their imposing solemn character, most attractive landscapes are to be found on the coasts, which face the open Atlantic. For there appear the perpendicular, wall-like cliffs, attaining a height of perhaps 2000 feet, and washed by the powerful breakers, which have worn in them caverns as imposing on account of their size and solemn half-darkness as they are attractive by reason of their beautiful coloring. Outside these cliffs walls, there are innumerable cuts and isolated cliffs, usually called "*drenge*" (*boys?*), which often have the most wonderful shapes, now resembling triumphal arches, now colossal statues, and which often approach a height of many hundred feet. Both the "*drenge*," which are grass-grown on top, and the rocky walls, even, serve in many places—particularly in the bird-mountains, as they are called—as dwelling-places for innumerable sea-birds, these birds, especially sea-parrots, auks, loons, and in certain spots, gulls, sit on shelves, as it were, which are formed by the strata of the mountain-masses, all the way up the cliffs, and their squalling and shrieking enliven the scene.

The reader is requested to excuse me if, in this description, I

have been more detailed than might, perhaps, seem to be suitable here, but I believe that all the circumstances cited, especially those in regard to the character of the landscape, have a not inconsiderable influence as will easily be perceptible later, on the condition of health of the dwellers on the Faroes, and that this influence is to be rightly sensed first through a somewhat detailed description of circumstances that exist there

First, as concerns the raw and cold climate that has been mentioned, the conclusion will already have been drawn from what has gone before that it might cause many cases of rheumatism, which are, in fact, quite common During my stay I saw a great many cases of constant as well as of transient rheumatic pains, many rheumatic watery joints, and white swellings developed from them later, many cases of heart-disease, and certain cases of paralysis, which appeared to be of rheumatic origin, and some cases of rheumatic fever After measles, diarrhea, as well as violent colic pains, was frequent, and often vomiting occurred together with these, and a considerable prostration of the powers, just as in the so-called Danish cholera These symptoms appeared, in different degrees, of course, with almost all measles patients who had been exposed to the cold too soon, and often disappeared quite as quickly as they had come, if a suitable regimen, along with the medicines which each symptom indicated, was put into practice and used, while, on the contrary, with an unsuitable diet, they became chronic, especially the diarrhea, and there is no doubt at all that they were in most instances of rheumatic origin It is so much the more natural that all sorts of rheumatic affections should be especially frequent on the Faroe Islands in that the occupations of the inhabitants, particularly in the summer, require them to spend the greater part of the day in the open air, and their attire, which is the same for summer and winter, is not in all respects adequate to its purpose Thus, their foot-gear consists of long stockings and sort of shoes or sandals which they sew together with strips of lambskin, and which are so thin that the soles are often worn through in one day As soon, therefore, as they emerge from their houses and go into the wet grass, or upon the swampy

Measles on Faroe Islands in 1846 835

ground, or wade the rivers, they get their feet wet In regard to this, they are so indifferent that they neglect to change their foot-wear, even if they have opportunity to do so With many, particularly the older men, who often do not use suspenders, the center of the abdomen is covered only by the woolen shirt, which, by the way, nearly all wear next to the body,—because the vest or jacket above and the knee-breeches beneath do not meet each other

And so, from this description of the climatic conditions, the conclusion has probably already been drawn that chronic affections of the bronchial mucous membrane are of frequent occurrence Chronic bronchitis is, without doubt, one of the commonest diseases on the Faroe Islands, to which fact not only the raw, cold air, but the salt-particles suspended in the mists, which may even cause erythema of the skin of those not accustomed to them, appear to contribute much This disease often lasts so long that the patients die of it under hectic symptoms, and according to the information which I have been able to get, appears to be one of the most frequent causes, if not the most frequent cause, of death among the older people on the Faroes Scrofulosis, in its various forms, no doubt occurs on the Faroes, and the allied tuberculosis is clearly not quite unknown on them, but both are, however, rather rare diseases, in any case,—a conclusion which I believe I may draw, as far as tuberculosis is concerned, from the fact that though during my stay I stethoscoped certainly many hundreds of patients, I met with only two cases in which the stethoscopic signs enabled me to diagnose phthisis with assurance On the other hand, I saw a considerable number of patients who were hectic evidently as a consequence of chronic bronchitis, at least, the stethoscope and the progress of the disease argued in favor of this diagnosis, of which, very unfortunately, I was not able to get the clearest proof by undertaking obductions, since the Faroe folk would by no means permit them Since malaria is a disease entirely foreign to the Faroe Islands, as we shall hear later, Boudin's assertion as to the antagonistic relations between malaria and phthisis might be used as an argument against us, in that the

idea might be conceived from it that phthisis is very common on the islands, and at first glance, such might actually seem to be the case, if, for instance, distinction were not made between really tuberculous patients and patients who are hectic as the result of very prolonged bronchitis. But the great humidity of the atmosphere, for which the soil is not to be blamed here, but the surrounding sea, and its fogs, which do not, therefore, contain the constituents that characterize swamp air, but on the contrary chlorin and particles of salt, and the like, might well be supposed to oppose at the same time the development of malaria, which flourishes best in an atmosphere moistened by swampy soil, and of phthisis, which is most destructive in torrid and dusty regions—even if we do not take into consideration the contradictions which Boudin's assertion, though justly supported in great part, has encountered. In the meantime, whether the fact that scrofulids and tubercles appear to be so rare on the Faroes is due to the influence of the climate or to that of the food, which is too largely animal, it is very difficult to decide. That chest affections—for instance, chronic bronchitis—were far more frequent than usual during my stay on the Faroes, when measles was prevailing, is natural. In making that assertion in regard to the frequency of bronchitis as a disease and cause of death, I have not, therefore, taken account of those cases in which measles was the starting-point of chest affections, and I support my assertion only on the many cases which I have observed, in which the disease had no connection with measles, and in which there was found no sign of tuberculosis of the lungs, together with the fact that among the causes of death given on the Church registers scarcely any other is often found so often as "chest complaints." Pneumonia was far rarer, at least, during the epidemic of measles, I saw only 8 cases of it, which, however, offered no plain stethoscopic sign, but in which the glutinous expectoration, from which I washed out Remak's fibrinous, ramified bronchial coagula, did not permit me to doubt the accuracy of my diagnosis.

Whether the menstrual disorders so extremely frequent on the Faroes, bringing the whole host of hysterical affections in their train, are due to colds from the raw and cold climate, from getting

Measles on Faroe Islands in 1846 837

the feet wet, which even many of the women cannot well avoid, and especially from going out into the mountains to milk the cows, or whether these disorders are due to the very sedentary life which is the lot of most Faroese women, I cannot decide with certainty, but the former appears to me to be probably the most frequent cause of these troubles. As another occasion of colds, the fact that the Faroese women never wear drawers should not be passed over in silence.

If it were desired to write something about the skin diseases that are rather frequent on the Faroes from the effect of the climate, urticaria and psoriasis would be named. The latter affection is not rare on the Northern Islands, though I saw it only among the men, and in particular, on the lower extremities. This fact might lead to the assumption that the effect of the salt water on the skin is blamable, the more reasonably in that the Northerners are occupied mainly with the sea. That the effect of salt water, whether encountered in the sea-water itself, or in the mists, is not without influence upon the origin of skin diseases was exemplified by my own case, for every time I went on a trip that lasted a few weeks, a combination of urticaria and eczema appeared on my hands, which, especially in warm weather, caused an unbearable itching, but which disappeared if I remained for some days in one place, and ended with desquamation. Whether the remarkable abnormalities of desquamation after measles, especially its extraordinarily long duration among men¹ in particular, should be ascribed to the same influence, I cannot tell.

Since it has been proved that the frequency of mental diseases is generally in direct proportion to civilization and the social collisions accompanying it, it might be suspected that these diseases are extremely rare on the Faroes, inasmuch as civilization has certainly not attained a high degree there, and the social collisions so agitating to the mind, with the patriarchal conditions which prevail there, are proportionately so few. But on the

¹ In the case of a man, I saw even in the 11th week following the measles a considerable desquamation on the hands, elbows and tibia, with many, desquamation was still present in pretty marked degree 7 weeks after the exanthema had disappeared.

contrary, there is hardly any country, hardly, indeed, any metropolis, in which mental diseases are so frequent in proportion to the number of people, as on the Faroes. Unfortunately, I am not able for the moment to present positive statistical data in regard to this proportion² but I have been in most of the towns of the islands, and can assert that in nearly all places that are inhabited by 100 or 200 persons one or more weak-minded persons are found. This fact is the more remarkable because the Faroe folk in general are distinguished for excellent mental powers. In this connection, a strange agreement in the forms of the disease is observable. Among many it takes the form of quiet religious madness, under which the afflicted persons have visions, and believe that they live in direct communication with the spirit world, with Christ, the Holy Spirit, the Virgin Mary, and so on, perhaps others, again, believe themselves beset by evil spirits, which compel them against their will to act in a manner contrary to their better knowledge and desires, so that, when they are unruly, they knock about and destroy the things around them, and later subside into melancholy, angry grumbling. Both forms seem to pass rather rapidly into fatuity, which, moreover is innate with some, and with others does not make its appearance until the age of puberty. If I have described the Faroese landscape in unusual detail, it is because I feel almost certain that the impress made by the character of the landscape, in connection with the frequent fogs, upon the mind is the most potent predisposing cause of the frequency of mental diseases on the Faroe Islands. Without attempting to draw a parallel with the Alpine cretins, I shall permit myself to call attention here to a few circumstances which strengthen my views. To an unbiased observer it is unmistakable that the character of the landscape is reflected, so to speak, among the Faroe fold, in the kindness of the national character. Probably the physical and psychical exercise which the nature of mountains always requires of their inhabitants, and which moreover, is rendered necessary on the

² Dr Hübertz's estimate that on the Faroes only one insane person is found among 277 individuals is manifestly too low, and yet, according to the survey reported by him, even this proportion is almost twice as unfavorable for the Faroes as for Copenhagen.

Faroe Islands by the struggle against the boisterous ocean, produces in the Faroese the same liveliness, thoughtfulness, and vigilance, which characterize the inhabitants of most mountain regions, but yet there is always a certain seriousness diffused over the Faroese, left to himself, he is introspective, and even his cheerfulness, though sometimes combined with a noise like the roaring of the sea, also bears an extremely monotonous and often almost melancholy stamp. In expressing his opinion, he is usually reticent and not sincere, he is often as hollow as the cliffs of his islands. The isolated social life and the common dangers occasioned by the natural conditions certainly tend greatly to strengthen the feeling that all men are brothers, and it is to the praise of the Faroe fold that they show forth this feeling by their actions. Sympathy is very easily aroused in the mind of the Faroese, and with Christ-like compassion, he is ever ready to extend to the needy prompt assistance, whether it be with work, provision, clothing or money, however high a value he is accustomed to set on these things. The grandiose stamp which the Faroese landscape so often bears, and the mystical effect which mists, skies, breakers, waterfalls, cliff-caves, and so forth, involuntarily exert upon every open mind, must awaken in every thinking and feeling person thoughts of God's omnipotence and man's insignificance, which tend to stir and foster a religious inclination. This is found in high degree among nearly all the Faroese, but sad to say, it must be stated that very probably in great part because of the influence of the earlier priests, it often borders on bigotry and appears like hypocrisy, thus, the names of God and of Christ are forever on their lips, to perform any work whatsoever on Sunday is regarded as a great sin, to attend the services of God and diligently to enjoy the sacraments of the altar are, on the other hand, works especially pleasing to God, and the priest is looked upon as a superior being, very nearly akin to the deity, however envious the people are wont to be of his income. Moreover, their sense of freedom and pride, which protests powerfully against any condition of dependence, and which makes it necessary for persons in office to beg, yes, importune, pay, and express thanks, every time he wants a service

of a Faroese, appears to stand in at least partial connection with the physical character of the country, since the same trait is found among most mountain and seacoast people. Still more indicative of a mental impress unconsciously received from the character of the natural surrounds are the differences in this respect among the inhabitants of the different regions—in fact, of the individual villages even, which are in harmony with the character of each region or village. Of this fact I might offer many very remarkable examples, for instance, the difference of the Northerners from the Southerners and the Sandø (Sand Island) people, the special stamp of the Tjornevig people, and so on, but it would take too long to enter into further discussion of this subject, and, moreover, it would scarcely be possible to make it understood by those not familiar with the localities. With respect to the agreement which exists as to the ways in which mental diseases are manifested among the Faroese and the harmony between the stamp of mental diseases and the impress which the mind unconsciously received from the Faroese landscape, I believe all will agree with me in thinking that the peculiar natural conditions are probably the most important predisposing cause of the mental diseases of the Faroese,—in regard to which the usually very low stand of the barometer is perhaps, also of significance.

As factors which seem partly to develop this disposition, partly to furnish an occasional cause for an outbreak of the disease, I think the following circumstances, brought out by social conditions, should come under special consideration.

The views expressed by Lucas Debes, in his *Faeroea Reservata*, to the effect that devilish vexation and Satanic delusion by fairies, hobgoblins, and mermaids, and perhaps through the power of Christianity, become rarer, but were still far from having ceased to riot, in regard to which he cites many examples derived from his own experience, which also show what power the prayers of God-fearing priest have to frustrate the magic power of fiends, still prevail among the people, but with the alteration that the more enlightened believe that in our time Christianity has become so mighty that fairy folk and the like no longer venture

out on the surface of the earth, and that the priests are no longer so well instructed in the "black art" in Copenhagen. Not very many years ago, it seems that Faroese priests were still trying, probably because they felt flattered at enjoying a more than human dignity, to dupe the people by regular tricks, and by soothsaying and sorcery to make it believed that they themselves were in immediate communication with the higher powers, and that they could heal the sick by witchcraft. At this day the country folk come frequently to the priests and offer to pay them to bring back people, sometimes children, who have got lost in the mountains, or to make their influence with the higher powers bring forth the best results for a dear sick one. But to tell the truth, none of the Faroese priests of our day encourage the common people in superstition or bigotry, but as would be expected of enlightened men, to the best of their ability combat these errors by word and deed. The reserve and lack of sincerity of the Faroese towards the Danish have doubtless been increased and fostered by the fact that in recent times so much has been written by persons not well acquainted with circumstances about the grievances of the Faroese in regard to their language, school conditions, and so forth, but it is certain that these characteristics were not produced by such an influence.

The drinking of spirits has not really become general on the Faroes, only a few, who then are confirmed drunkards, using it dietetically, but on holiday occasions or on journeys great quantities of a distilled liquor, which thanks to the market, is certainly pretty thin, are drunk. However, if consideration is taken only of confirmed drunkards, who, as we have said, are rare on the Faroes, I believe that a closer investigation than I was able to make in regard to the matter would show that among the Faroese inebriates relatively more become delirious than with us, a fact which would indicate a predisposition of the Faroese folk to mental infirmity, and this again, much be ascribed to the probable influence of the natural surroundings.

According to the statement of an officer intimately acquainted with conditions, onanism is probably not rare on the Faroe Islands. Among other examples, I can cite the instance of a

mother who, when her son desired to marry, forbade him to do so, and taught him, as a substitute, to practice onanism. The unfortunate fellow carried this habit to such an excess that his mind became weakened, and in his more lucid moments he cursed his mother with the most horrible oaths, because "she had wasted away his oil of life." Although the fact that circumstances often do not permit marriages that are wished for, and debauchery with the other sex often appears dangerous to the prudent Faroese, might in part explain this perversion of the sexual instinct, yet it seems to me not unlikely that the disposition which the unconscious impress of nature produced in the inhabitants may develop a sort of predisposition to this vice, which, too, again both develops an attending disposition to mental disease and becomes a powerful occasional factor in its evolution. Yet it is, of course, impossible to decide whether this vice is more general on the Faroes than in Denmark.

If, after this little digression, we turn to a consideration of hygienic conditions in connection with the mode of life of the Faroese, we find them not less different from ours than the physical conditions described above.

First, as concerns their food, the Faroese have three principal meals: breakfast, from 8-9, dinner, from 12 to 2, and supper, or "evening food," from 9-10 in the evening. In the morning they have milk, oftener sour than sweet, and with it "*drujl*" and "*skjaerpekjød*" or "sharp meat." *Drujl* is unleavened barley bread, generally baked the evening before it is to be used, but by some preferred hot, and in that case, prepared in the morning shortly before it is eaten. It is made of flour and water, and is formed into rounded sticks, about a foot long and from $1\frac{1}{2}$ to 3 inches thick, which are usually baked only by being laid on hot embers or coals, only a few bake them in grates. In consequence of this method, the crust is burned, but the dough inside often remains quite raw. At butchering time, boiled lamb's blood is used instead of *drujl*, especially by the poor. *Skjaerpekjød* is wind-dried lamb meat. In the autumn the sheep and lambs designed for slaughtering are shut up in readiness, and at one process, or, at least, as rapidly as possible, every

man butchers his own lot. The bodies are flayed, eviscerated, and hung up, without any sort of particular preparation, to dry in an outhouse. Although probably some influence³ towards preserving the meat may be ascribed to the salt particles suspended in the mists, yet it must undergo a considerable degree of putrefaction, which differs, however, according to the weather which prevails during the winter while the meat is drying. By Shrovetide the *skjaerpekjød* is generally ready for use, it is carved into small pieces, as it is eaten, and is eaten raw, with the *drujl*. Later on, in the summer, the "sharp meat" gets full of maggots, which still further increases its rank odor and taste.⁴

Dinner, or "midday food," consists of two dishes. One dish is usually soup, that is, barley meal or barley groats boiled in water, with a goodly addition of "baut," which means all sorts of fat things especially rancid tallow and other rancid fats. More rarely groats (grits) are used, with which also they always cook a good deal of *baut*, these are eaten mostly with sour milk. The other dish, which, by the way is eaten first, consists of "*rast*" that is, half-spoiled meat or fish. The same method of preserving meat which is used for lamb is used also for "grinde-meat,"⁵ fish, or bird meat, all are hung up to dry. Without any preparation by salting, smoking, or the like. In the course of several months, when the meat or fish is neither fresh nor wind-dried, it is called "*rast*" a word that can be translated by no other term than "half-rotten," an epithet fully merited by this meat, if consideration is given to the abominable odor it spreads, its unpleasant, mouldy appearance, and its, at least not infrequent, occupation by maggots. This *rast* meat is usually cooked before it is eaten, though some people prefer to eat it raw, especially when it is becoming somewhat wind-dried. I have seen a whole

³ This influence cannot be great, since experience shows that "sharp meat" becomes ranker the foggier the weather is while it is hanging out, even after it has dried.

⁴ Even the officials, as a rule, grow accustomed to "sharp meat" pretty quickly, and of course consider it quite dainty. I could not, however, by any means, find any pleasure in this food, which was so disgusting to me that it nauseated me.

⁵ "Grinde whales" are a species of dolphin, which swim around the shores in great schools of 100 to 1000, and which, when a school strays into a fjord, are driven upon the shore and killed, such a *grinde-drive* is the greatest delight of the Faroese.

boat's crew (8 men) eating raw grinde-meat with great appetite, although it was so badly putrefied that its stench nauseated me in the open boat, while the bottom of the boat was white in places with insect larvae, which had partly crawled out, partly been picked out of the meat. In case there is no *rast* meat or fish, "sharp meat" or "*grinde-twist*," that is, wind dried *grinde*-meat, or dried fish is eaten, and always in the raw state. The evening meal, which the Faroese are accustomed to take just before they go to bed, is essentially the principal meal, and consists always of a dish of hot meat, chiefly fresh meat or fish, the fatter the better, and usually accompanied with potatoes. If there is lack of fresh meat or fresh fish, which are to be had only in butchering season or when there has just been a bird-catching, hunting, or fishing excursion, *rast* meat or *rast* fish is used, with salted "*grinde-lard*." As a drink during or after meals boiled milk is used, which is generally separated by rennet or vinegar, or else a mixture of sweet or sour milk, or the soup mentioned above. It is remarkable that chicken-meat is disliked by most Faroese. Festival dishes, such as *knytlínger*, or boiled fish-balls, *skindsekjod*, or lamb meat first cooked and then salted and dried, roast meat of all kinds, cooked or salted beef, and pork or bacon, separated milk, cooked with raisins and currants; boiled or roasted mussels and limpets, peas, boiled rice, boiled eggs, pancakes, cakes, rye biscuits, rye *drujl*, and fine wheat break are not seen so often, since not even the richest indulge in such rarities for daily use, special among the Faroese sweets is the much-liked "*Kvanner*," the peeled stalk of *angelica archangelica*. This is usually eaten by itself, but sometimes the well-to-do people have sugar and cream with it, as we eat strawberries. Children like, also, to eat sorel, which grows wild. Tobacco is used even by the women, who smoke chalk pipes of the size of thimbles. Coffee is used in general only by the more wealthy people, but at trading-places many poor people are addicted, so to speak, to its use. We have previously touched upon the use of spirits. Wine is employed for daily use by none of the Faroese, but it is not seldom used as a universal remedy, as also are "heart-strengthening drops," or Hoffmann's anodyne,

and the like, which are used almost dietetically by an exceedingly large number of women

Every Danish person will certainly regard such food as very unwholesome, if on no other grounds than that people are disposed to consider the food to which they are accustomed as the wholesomest and best. The Faroese find it likewise as disgusting, however, that we eat old Norwegian cheese as we that they eat half-decayed *grinde*-meat, and so forth. They usually think it absurd that we ruin our good lamb flesh by salting it, as we do that they made "sharp meat" of it.

Again, we are strengthened in our idea that the Faroese food is unwholesome by investigating the physiological effects of the different Faroese foodstuffs, which we shall now briefly review.

The fresh and still warm unleavened and almost raw bread (*drugl*) is yet less digestible than freshly baked rye bread. It is certainly not without effect upon the dyspepsia which is so frequent—in connection with cardialgia (heart-evil) and pyrosis—among both the men and women, but particularly the latter, who lead more sedentary lives. The *rast* meat of all kinds produces cardialgia and pyrosis, but a more constant effect of it, when it is eaten in quantities, is diarrhea. Since the bird-catching is done in the summer time, by autumn the bird meat has, of course, become *rast*, this is explained by the fact that, as a trustworthy Faroese, well acquainted with conditions, assured me, the inhabitants of Viderø Island and all the places where there is much bird-catching, suffer in the autumn and winter almost constantly, more than other villages, from extremely tedious and exhausting diarrhea. Likewise, when there has been a catch of *grinde*-whales (ca'ing whales) in a village, the residents who get the most *grinde*-meat usually, according to the statement of a certain man, suffer from diarrhea as long as they have any fresh or *rast grinde*-meat. The flesh of the *grinde*-whale, which is quite lean, tastes, by the way, like coarse beef, and prepared as we are accustomed to handle it, may afford good food, but the Faroese eat together with this lean meat a quantity of fat, and only a relatively inconsiderable portion of the meat is eaten while it is somewhat fresh. *Rast* fish also causes diarrhea. It is,

moreover, natural that since the degree of putrefaction at which the meat arrives while it is hanging up to dry depends upon the weather, this diarrhea, which usually prevails in the autumn, is more violent and makes its appearance earlier, if the summer and autumn have been unusually humid and yet quite warm, as was the case in the summer of 1846, which was the most humid that the oldest people of the Faroe Islands could remember. The fresh meat seems to be better the fatter it is. Halibut are caught rather frequently, and the liver of coal-fish and of the haddock, which are well-known to be very fat, is prized as the most delicious morsel. Such quantities of fat likewise cannot have other than a purging effect, and with persons who have weak stomachs and who sit still a great deal, cause disturbances of digestion. The wind-dried meat, with its rank taste and smell, quite clearly cannot be classed among easily digestible articles of food. Taking sour milk the first thing of a morning and when out on the arduous mountain trips, drinking ice-cold river-water in considerable quantities, which few refrain from doing, must often give the inhabitants occasion for colds in the intestinal canal. *Kvanne*, when eaten in large quantities, always causes a burning sensation in the back of the throat, almost like that of senega root, and cardialgia, pyrosis, nausea, vomiting, diarrhea, general derangement of health, and sores on the lips and in the mouth. The outer rind of these stalks, which are peeled, of course, before they are eaten, but not always with proper care, is such a powerful rebefacient that it is very common to see sores, psoriasis-like places, and erythema on the children's arms and legs, which appear when they go out in foggy weather to gather *Kvanne*. But if these foodstuffs have such an effect on the healthy organisms, it is the more obvious that they would be injurious during and after any febrile illness. There was special opportunity to observe this truth during the epidemic of measles, for many continued, in spite of all admonitions, to use their ordinary food, both during and after the measles. This was partly because of the power of habit, which is so strong that the inhabitants prefer their usual food to any other, and are wont to consider it the most wholesome in all circumstances, and partly

Measles on Faroe Islands in 1846 847

because of inability to obtain more suitable victuals. The poor Faroese earns, as a rule, for instance, only as much as he will consume on the following day, only of *rast* or dried fish and *grinde*-meat has he usually a little ahead, but of grain, especially in summer, rarely more than a half-bushel or one or two bushels, and the greater number of the inhabitants may be called poor. However considerable the offering which the almsboxes might receive in the summer, the number of the needy is so great, and the dwellings are so remote, that it is impossible for all to receive timely assistance. And so, if the small reserve of grain which was to be found in a house at the outbreak of the disease was used up for barley soup and the like, while, perhaps, all the family had measles at once, during convalescence they had to return to their usual food. Not many at one time could have barley or oat soup during the measles, but some had to be content with milk, usually sour, some, who had the disease in mild form, used the ordinary Faroese food the whole time. After the measles they generally found the more reason for eating *rast* meat and fish, and fat and very rancid *baut* in the soup, in that they felt weak and seemed to need something "strengthening," and they regard the strongest tasting and most indigestible food as the most strengthening. It was no wonder that after the measles the majority came to suffer from very tedious diarrhea, frequently persisting for many months, and often dangerously exhausting to the strength. It occurs to me as very probable that the inflammation which during the exanthematic fever is found in the Peyer's glands has, because of the irritating effect of the food, proceeded into ulceration, in many cases, although, for the reason stated above, I was not able to prove this by making obductions. The slimy, often light yellow, and odorless character of the excrements, together with the long continuance of the diarrhea, does not, as remarked before, argue against it. Generally speaking, I may assert that the gastric conditions, and especially the diarrhea, which occurred after the measles were most prevalent in the poorer districts, where the people live chiefly by fishing, and in those where the ca'ing-whales (*grinde*) were caught, while the wealthier and more enlightened in each

village, who could and would restrict themselves to the prescribed diet, faithfully, were quite exempt from this unpleasant sequel, or else suffered from it for only a short while, as the result of committing some indiscretion, on the other hand, it was the more common and severe, the poorer and more ignorant the occupants of the house were

Besides the hurtful effect cited, which the Faroese aliments exert directly upon the intestinal canal, it should be mentioned that hemorrhoids, plethora, and lithiasis are quite frequent diseases on the Faroe Islands, which is easily explained by the preponderance of animal food. But the Faroe folk are remarkable for excellent and durable teeth. Carious teeth are seen very seldom among the Faroese proper, and often people 70 years of age are observed to have complete sets of teeth, with whom, though, to be sure, the crowns of the teeth are usually worn off, as they are observed to be in the skulls of Greenlanders. This condition of the teeth must probably, then, be attributed partly to the firmness and toughness of the food afforded by the dried meat, and partly to the cleansing which is quite involuntarily given the teeth, every time a mouthful of their *drugl* is taken.

When a Dane would utterly condemn the Faroese food, after what we have stated here regarding it and its effects, and would boast that his food is better, we should at the same time call his attention to the fact that there is some doubt as to whether the Faroese or the Danish food is, on the whole, the more wholesome. When we later come to compare the rate of mortality on the Faroe Islands with that of Denmark, we shall see that, while the greatest mortality among us is found between the 60th and 70th years, on the Faroes it is between the 80th and 90th years of life, and that the average length of life, which with us is 36 years, is $44\frac{2}{3}$ years on the Faroes, though in this estimate the still born are counted. Hereby it appears that the Faroese food is not quite so unwholesome as might be supposed at first consideration. Nevertheless, I am convinced that it might and should be very much improved, so that the longevity of the Faroese would become still greater, since the specially favorable rate of mortality on the Faroes, as I shall later seek to show by

Measles on Faroe Islands in 1846 849

statistical data, may also certainly be regarded as due to the freedom of these distant isles from many of the diseases which prevail among us

The Faroese houses are constructed in part of boards, thus the best houses are lined partially or entirely with untarred planks, and are covered outside with tarred planks, while others are only lined with planks, and are enclosed by walls consisting of stone, earth, and grass. The roofs are, almost without exception, thatched with green turf. The dwelling houses proper are of different sizes and arrangements, according to the means of their owners. The houses of the poorest folk consist of only one room, which serves at the same time as kitchen, living-room, sleeping apartment, and place for keeping chickens, and so on. The only door of this room, which is not lined with boards, is about 4 feet high, the floor is of earth, there are no windows at all, but a quadrangular hole in the roof, which may be closed by a shutter, serves at once for entrance of light and exit of smoke. The beds are arranged like berths, lengthwise around the walls, and outside them there is commonly a bench. An apartment thus arranged is justly called a "røgstue," which means a smoking room, for it is usually so full of peat smoke that it is often difficult to understand how human beings can breathe in such an atmosphere. The Faroese really seem to take pleasure in peat smoke-laden air, however, for I have frequently seen people sitting by the fireplace drawing into their nostrils with true delight the peat smoke from the burning pile, and ancient traditions show that the Faroe folk even in olden days could well tolerate smoke, and sometimes used it to smoke Danish people out. As for me, I was not seldom obliged to rush outside repeatedly to draw breath, before I could finish seeing and examining the measles patient who lay inside without being troubled by the atmosphere, to which they were accustomed. In our time, however, very many even poor Faroese are accustomed to have, besides the smoking-room, which is always arranged effectually in the same way (except that with the wealthy it is larger and is furnished with a sort of chimney) and is an indispensable part of every Faroese dwelling, another room, rather small, to be sure, called

a "glass parlor" an apartment with glass windows, plank ceiling, and plank floor. Only the wealthiest are wont to have, in addition to a capacious smoking-room, which is often used as a living room, but always as a common eating room and a place for the servants to sleep, a pantry and several glass parlors. One of the latter is kept unoccupied, so that officials and other important visitors may be received in it, this room is usually very tidy, and it always contains, along with other furniture, a well made up canopied bed. A second glass parlor where the weaver's stool stands, has generally a pair of beds, and sometimes there is a third glass parlor, which most of the family use as living and sleeping room, these last two apartments are not usually remarkable for the cleanliness which is observable in the state parlor.

The features of the Faroese dwellings which may be supposed to be injurious to health are the following 1 The peat smoke with which their atmosphere is impregnated 2 The dampness and bad air, which are due partly to the dirt floors of the smoking-rooms, along with the damp earth of which the walls and roofs are composed, and which, even in the glass parlors with wood floors, is just beneath the boards, and partly to the meagerness of the amount of air to the individual, because of the contracted dimensions of the houses, which proportion is diminished still further in the glass parlors, because only outside-lighting stoves are used in them 3 The drafts, which are encountered particularly in the smoking-rooms

It is obvious that these factors must have an especially injurious influence during the epidemic of measles, but their effect is perceptible at other times, also. Chronic blepharo-adenitis and conjunctivitis are very prevalent among the older folk, and in time are liable to pass over into lippitude. Though the climate has certainly no happy effect on these eye-affections, it seems probable, however, that the most important cause of their frequency is the peat-smoke of the smoking-rooms. This assumption is strengthened by the frequent occurrence of these affections among the old women, who make their abode in the smoking-rooms, and go out very little into the fresh air. That chronic

bronchitis, also, and all sorts of colds, the prevalence of which must be attributed mainly, however, to the climate, are rather promoted than counteracted by the arrangement of the houses, is clear. That leukemia and chlorosis are not more frequent than they actually are, by reason of conditions depicted above, must surely be due mainly to the strong animal food. In only the most wretched of all the huts did I see leukemic and chlorotic women, I do not recall seeing any leukemic men on the Faroes. It might be thought that Bright's disease would probably take hold in such houses, but as far as I could perceive from my investigations, such is not the case. I was not rarely consulted by old people with oedema of the legs, and I always examined their urine by boiling it in a test-glass, but never found albumin in it. On the other hand, a very close examination almost always proved the presence of heart disease.

The matter of clothing has already been referred to by us, to the effect that it does not adequately protect the body from the rigors of the climate. We need make no further mention of it here, therefore, except as regards its uncleanness. That it is of woolen stuff outside and inside, as a rule, is certainly in conformity with its purpose, as far as the climate is concerned; but it is plain, also, that vermin—for instance, lice and itch mites—thrive in the woolen shirts, which are seldom ever changed. The odor which the clothes of the Faroese acquire from the fact that they wash their things in urine, whereof the production of the whole family is preserved in a great vat, appears to be not unpleasant to these small beasts, at any rate itch is an extremely common disease, and very few families are free from lice.

As among the most important hygienic factors, the daily occupations of the Faroese should not be passed over in silence. The employments of the men, are, in particular, tending to sheep, fishing, bird-catching, a little agriculture, and peat-cutting. All these occupations keep them out in the open air, especially in summer, and require considerable physical exertion. By this they are hardened, and become able to digest their tough food, but they suffer very greatly from the effect of the climate, as mentioned above. Accidents which call for surgery, such as

fractures, luxations, wounds from falling, and injuries from the knives which they always wear at the side in cases like poniards, are also common, and hernia is not rare. In winter the men also stay more in the houses, and help with making up the wool and sewing clothes.

The activities of the women usually keep them in the houses, where they attend to the cooking and washing, and all the other indoor business, but especially knitting woolen jackets and stockings, weaving, and the like. Milking the cows is the only task that requires the girls to go out on the mountains, and at harvest time they help with housing the hay, and with gathering and drying the grain. Sitting still so much and staying in the corrupted air within the houses cannot otherwise than promote hysteria, digestive disturbances, disordered menstruation, and so on, among the women, and they are likewise more liable, on account of these circumstances, to take cold during the field work in the autumn. The effect of the daily employment of these women on their constitutions may be seen in the striking difference that is observable between the women who have to go out into the mountains to milk the cows and the others. The Faroese women are finely built, often graceful indeed, and when they have passed the 40th year, they are spare, but the girls who milk the cows are robust, like our servant-girls. It is singular, however, that even with hard work they do not spoil their remarkably pretty little hands and feet, and again, it is strange that menstrual disorders are as frequent among the milkmaids as among the other women, which would indicate, as suggested above, that colds may be considered one of the most important causes of these disarrangements.

In order next to obtain a clear survey of the effect of the epidemic of measles on the rate of mortality on the Faroes, I have collected various statistical data, which, on being compared with those of the rate of mortality in Denmark, appear to be interesting in many respects.

Since the Faroese almost never emigrate and foreigners have almost never settled on the islands, and moreover, the number of individuals who compose the families of Government officials

Measles on Faroe Islands in 1846 853

cannot differ so much as to cause any considerable variation in the population, the censuses on the Faroes yield truer results with respect to the increase of population by the excess of births over deaths than in Denmark, for instance. But according to the censuses for 1782, 1834, 1840 and 1845, the population of the Faroes was as follows

	1782	1834	1840	1845
On the Northern Islands (Norderøer)	585	862	913	953
On the Eastern Island (Østerø)	1,040	1,648	1,777	1,910
On the Stromø, with Hestø Kolter and Nolsø	1,375	2,169	2,255	2,405
On the Inlet Island (Vaagø) with Mosquito Point (Myggenæs)	384	642	694	748
On the Sandø Island (Sandø) with Skuø and Great Dimon	388	552	569	610
On the Suderø	637	1,055	1,100?	1,156
Total	4,409	6,928	7,308	7,782

If it is desired to find an average number for the population between the years 1834 and 1845, by adding 6928 and 7782 and dividing by 2, then computing a yearly average for the increase of population in these years, and finally computing the percentage of the yearly increase, the latter is found to be 105% in the time concerned. For Denmark, on the other hand, it is only 083% for the years 1801-1834. Thus, comparison is considerably in favor of the Faroes.

Since, according to Dr. Casper's computation of more than 60 million people, it seems to hold good that the measure of mortality in a colony is in direct relation to its general fruitfulness, it might consequently be expected to find a high mortality on the Faroes, but such is far from being the case.

Udall's Health Officers' Handbook, which is nearest my hand for comparison, presents an intelligent review of the increase of longevity in Denmark, computed for 1000 men, according to an average of five years, for 1784, 1828, and 1833, and observes, besides, that conditions were about the same with respect to females, and that the five-year period ending with 1833, inclusive, gives an unfavorable scale because of the bad epidemics prevailing

Medical Classics

within it On the Faroes, for the years 1835-1845, inclusive, I have counted 1059 deaths, which were taken from the carefully compiled Church books, for all the parishes except that of Suderø, when I possess no statistical data Since 60 still-births are included among these 1059 deaths, the numbers below may, of course, be used for comparison only if it is borne in mind that the number of deaths for those under 10 years of age is correspondingly greater than it should be

	Of 1000 males in Denmark died, according to an average of 5 years			Of 1059 persons died on the Faroes in the year 1835-45 inclusive
	1784	1828	1833	
Under 10 years	458	385	366	279*
Between 10 and 20	40	39	43	60
Between 20 and 30	57	55	56	72
Between 30 and 40	62	54	60	68
Between 40 and 50	73	74	77	81
Between 50 and 60	85	91	105	60
Between 60 and 70	104	115	123	90
Between 70 and 80	81	118	113	164
Between 80 and 90	34	60	51	169
Over 90	7	9	6	16

* Under 1 year 199 Between 1 and 10 years 80

In whatever manner comparison is made in regard to this, it is obvious that the rates of mortality are far more favorable for the Faroe Islands than for Denmark While the mortality among children under 10 years of age is 366 to 1000, in Denmark, on the Faroes it is only 279 to 1059, though 60 still-births are included among these 279 While in Denmark the greatest mortality (except that of children under 10 years) is found between the 60th and 70th years of life, on the Faroes (likewise excepting children under 10 years) it is found between the 80th and 90th years of life, and while in Denmark, of 1000 who died, only 122-187 were over 70 years old, on the Faroes, among the same number of people, 349 lived beyond that age

As is known, the average length of life has been computed for the different European countries For Russia it is stated as 21 3, for Prussia, 29 6, for Switzerland, 34 6, for France, 35 8,

Measles on Faroe Islands in 1846 855

for Denmark, 36, for Belgium, 36 5, and for England, 38 5 years I attempted to find the average age for each parish on the Faroes, except Suderø, by adding the ages of those who died from 1835-1845, inclusive, and afterwards dividing by the number of individuals, so that I included the stillborn, wherefore the number representing the average length of life is quite a good deal less than it would otherwise be. In this way I found the average length of life for Nordstromø to be 41 5, for Sydstromø parish 43 9 for Osterø 39 7, for Vaagø 48 8, for Sandø 49 8, for the Northern Islands, 43 7 and for the whole of the Faroe Islands, with the exception of Suderø, 44 6 years. It is thus still clearer how favorable the rates of mortality are on the Faroes, for such a high average age is not known, as far as I am aware, for any other country in the world.

A closer observation of the table set up for comparison will show that the difference between the rates of mortality of Denmark and the Faroe Islands consists essentially in the fact that in Denmark more children under 10 years of age die than on the Faroes, and that on the other hand, a far greater number reach the age of 70 years on the islands than in Denmark. For the most vigorous age—between 10 and 50 years—it is found, however, that the mortality is higher on the Faroes than in Denmark. The natural explanation of the latter fact is that a disproportionately greater number of people meet violent death on the Faroes, by drowning in the dangerous fjords, and by plunging down from the mountains, then in level Denmark, surrounded by a calm sea. Thus, of the 172 who died on the Northern Islands from 1835-1845, inclusive, 20 men perished by accident, at their best age.

Having set forth these facts, I shall attempt to find out the reasons for these differences between the statistical rates of Denmark and the Faroes, both as regards increase of population and rates of mortality.

It would be absolutely at variance with all customary views, established by experience, as to the beneficial or injurious effects of hygienic factors on the health, to try to find in the physical character of the country or in conditions dependent on the mode

of life of the inhabitants the principal causes of the favorable rate or mortality and the considerable increase of population on the Faroe Islands. A raw cold climate, with almost constant fogs and violent, unsteady winds, a group of islands separated by dangerous fjords, and consisting of high mountains, the roads and bypaths of which often deserve to be called "neck-breaking," and where the occupations of the inhabitants continually expose them to the effect of the climate and to the dangers which are involved in faring on the uproarious ocean and the perilous mountains, food which we are inclined to consider as indigestible, as injurious by reason of tainting the humors, as too preponderantly animal, and as unpleasing—in fact, disgusting, apparel in which the feet are almost continually wet, and because the men do not wear suspenders and the women do not wear drawers, the abdomen is exposed to cold, and which, moreover, harbors vermin and uncleanness, dwellings which are filled with smoke and are surrounded entirely by damp earth—all these features can by no means be supposed to tend to promote the increase of population nor to prolong the lives of the inhabitants. However, to avoid partiality, we must mention also those points in the physical and dietetic conditions which might be regarded as beneficial to health, and which thus might perhaps tend somewhat to make the factors described less harmful.

In praise of the climate it may be said that the temperature is fairly uniform, compared with that of other countries, reaching neither a very high nor a very low degree, that, on the whole, the air is free from animal and vegetable impurities, and that even if the latter sometimes—as after a slaughter of *grinde*-whales, for instance—threaten to pollute it, it is constantly purified and renovated by the frequent winds, and finally, that the atmosphere foggy with only water-vapor does not appear to be unhealthful, considering the average length of life ($38\frac{1}{2}$ years) in foggy England, which is greater than that of the rest of Europe, and considering that of the Faroes ($44\frac{2}{3}$) which is still greater. The mountainous nature of the country hardens the body by exercise, which is equally beneficial to digestion, blood, and liver. The food can be praised probably only in that it is free from spices and

Measles on Faroe Islands in 1846 857

palate-tickling ingredients, which tempt people to fill the stomach with more than it can digest, and of the houses nothing at all good can be said except that the drafts in them combat an altogether too overpowering accumulation of dust and smoke. The clothing is suitable for its purpose in that it consists principally of wool, and taken as a whole, is warm. The occupations of the men and the milk-maids may be regarded as healthful, in that the body is strengthened and hardened by continuance in the open air and by the struggle against nature. Nevertheless, that these apparently so weighty circumstances do not exert any essential influence on the mortality, or else are completely outweighed by other injurious factors, which are conditioned on the occupations of the men, is evident from the fact that of the 1059 dead from 1835-1845, inclusive, 538 were men and 521 women. Of greater influence are probably the social conditions, which, from the simplicity of their manners, permit the people to keep calmer than in the places where civilization has attained a higher grade, and which prevent extensive debauchery between the sexes, and foster that general inclination to helpfulness and kind deeds, whence it results, at least in the more generally prosperous villages, that the worst extremities are in some measure avoided.

It must not be supposed, however, that the circumstances cited as being favorable to health outweigh the injurious influences previously mentioned, and far less should the very favorable mortality rates be ascribed to the former.

Only with respect to the increase of population would it appear that the most substantial influence should be attributed to the frugal and physically hardening mode of living, and its generally greater serenity, in connection with the usually early marriages and the powerful constitutions with which the race who people the Faroes, and who originally sprang from Norway, are endowed by nature. At any rate, the credit is not due to the Faroese midwives that the increase of population (or the excess of births over deaths) is 1.05% on the Faroes, while it is only 0.83% in Denmark, and that of 1059 dead on the Faroes only 279 were under 10 years of age (counting 60 stillborn or children dead within 24 hours), while in Denmark, in the most favorable instances,

there were 366 under 10 years old (probably not counting still births) among 1000 dead. The relation between the stillborn and the living-born children is clearly not more unfavorable on the Faroes than in Denmark, but rather more favorable, and this in spite of the fact that the status of midwifery on the islands is almost inexcusable. For since the life of a Faroese midwife is attended with difficulties and dangers which are unknown in this country, and since withal she receives neither from the public nor from the respective individuals a compensation commensurate in any sense with her exertions, it is rare that a suitable subject is found willing to journey to Copenhagen to study midwifery. But even when a suitable woman has signified her willingness to do this, the directors of the Royal Institute of Nativity have frequently refused her admission into the establishment. As a result, there are on the Faroes very few trained midwives (if I remember rightly, only 4 or 5) which seems so much the more unfortunate because now no women are trained by the authorized physicians of the country, as they formerly were. It was, therefore, certainly to be desired that these methods should be ordered better than they had hitherto been, notwithstanding the repeated presentation of them by the bailiffs and provincial surgeons to the authorities concerned. Nothing could be more unjust than to draw, from the favorable conditions named above, the conclusion that in the mechanics of birth totally ignorant women can render the same service as well-trained midwives, for such an idea is quite sufficiently disproved by statistical investigations, and it is not to be doubted that the rate regarded as favorable for the Faroes with respect to increase of population and the proportion of stillborn children to living-born must be attributed to other circumstances, which are so favorable that they outweigh the injurious influences exerted by a badly ordered system of midwifery.

Little as the existing institution of midwifery can be supposed to promote the increase of population, no more can the favorable rate of mortality on the Faroes essentially be credited to the physicians, for it is a familiar fact that there are on the Faroes only one royally appointed physician and, formerly, one practising

Measles on Faroe Islands in 1846 859

physician, who both live in Thorshavn, and whose activities in consequence of the physical character of the country, must be still more ineffective and imperfect than in the Danish country districts. According to an average computation for 9 years, from 1837-1845, inclusive, there died yearly of the inhabitants of the respective parishes, as follows

	Per cent
In Sydström (with Thorshavn)	1 856
In Nordström	1 263
On Østerø	1 593
On The Northern Islands	1 691
On Vagø	1 376
On Sandø	1 634
On Suderø (according to the kind information of Candidate Manicus)	1 555

Now, since the people who live in Sydstrøm, and especially in Thorshavn, have very frequent opportunities to get medical assistance, while Suderø, for example, is sometimes not visited by a physician in a year and a day, it may be seen from this fact that the physicians on the Faroes do not have such a great influence on the rates of mortality as other factors, especially the financial circumstances and the physical character of the islands. It would be just as unreasonable, however, to assume that the appointment of more physicians would be superfluous, as to declare from the results cited above that midwifery is superfluous. As an example which might appear to count for the opposite, I will take the liberty of presenting the following. In the years 1780-1790, when there was no scientifically trained physician on the Faroe Islands, 223 persons died on Østerø which, in 1782, had 1040 inhabitants. Since, according to average computation, the people of Østerø increased yearly by $11\frac{2}{3}$ individuals during the ensuing 52 years, the population for 1785, or the average number of inhabitants in the period named, is plotted at 1075 individuals, accordingly, there died on Østerø from 1780-1790 one out of $4\frac{1}{3}$ individuals. From 1835-1845, inclusive, 299 persons died on Østerø, but the population of the island had increased so much, that in 1840 it had 1,777 inhabitants. If this is supposed to be the average number of inhabitants in the last named period, only one of $5\frac{1}{3}$ died in this latter period. It

might perhaps be said in reply to this statement that the measles prevailed in 1781, but this fact increased the mortality so little, as far as Østerø was concerned, that while the mortality on Østerø from 1771-1780, inclusive, according to an average computation, was $24\frac{1}{5}$ yearly, from 1781-1790, inclusive, notwithstanding the increase in the number of people, it was found to be only $19\frac{1}{10}$, on the other hand, there died in the year 1838, during the terrible epidemic of influenza, 47 individuals on Østerø, while, according to an average computation for 1835-1845, inclusive, only $27\frac{1}{11}$ individuals died yearly on this island. Since, then, the physical character of Østerø Island, as well as the mode of life of the inhabitants, seems to have been almost entirely unchanged during the periods concerned, and beside those cited, no unusual causes seem to have influenced the mortality, there might be an inclination to ascribe the not inconsiderable difference to the efficacy of the physicians. I think, however, that the efficacy of the physicians cannot generally be estimated, because it is impossible to make allowance at the same time for other factors, and the contradictory evidence found in the numerical results above, which were obtained by various methods, seems, furthermore, to be a proof of this. Only thus much is certain, that though the efficacy of the physicians, it seems, cannot be estimated as an essential factor in the favorable rate of mortality on the Faroes, nor does it become perceptible from a statistical survey of the mortality of the different islands, the employment of a physician on Suderø, an island of 1,156 inhabitants, which is now completely cut off, so to speak, from medical assistance, appears, from a humanitarian viewpoint, to be not only desirable, but necessary, if the influence of the physician towards rendering the rates of mortality still more favorable is not to be altogether discredited.

After having thus reviewed the causes which at first glance would seem to be able to exert some effect on the favorable rates of mortality on the Faroes, without so far having found any factor to which, on closer scrutiny, might be ascribed any essential importance in this respect, we are led to accept the assumption that the entire or partial exemption of the Faroe Islands from

Measles on Faroe Islands in 1846 861

a number of diseases, especially those which are infectious, which decimate the populations of other countries, is the most important of all causes of the favorable rates on these Islands, and the high limit of life of the inhabitants. This assumption becomes the more obvious when we run over, in brief, the diseases which are rare or unknown on the Faroes.

Scrofulosis and tuberculosis, the vast influence of which on mortality in general in other countries, and in particular, on the mortality of children under 10 years of age, while not unknown, are, however, in proportion to other countries, rare on the Faroes. Perhaps the specially favorable rate of mortality cited for children under 10 years might be explained by this fact. Perhaps the fact that the food of the inhabitants, is in general, so largely of the animal variety exerts an influence hereupon, but possibly the fact that until quite a few years ago syphilis was an almost unknown disease on the Faroes (of this more later) has contributed its part towards the relative rarity of the two families of diseases named.

Whether *skirrhus*, or cancer, occurs on the Faroes, I cannot say, I did not see any cases of it, and it is not probable that the disease should have entirely avoided my observation, unless it belonged at least among the rarities.

Bright's disease, which, at least among the patients lying in the General Hospital, is a very rare disease, I did not see on the Faroes, although I always boiled the urine of patients who suffered with oedema of the limbs or from other suspicious symptoms, I never found albumen in the urine, on the contrary, as stated above, usually heart-disease was detected as the cause of the oedema.

Malaria, and the accompanying infarcts of the liver and the spleen, etc., do not, as I have said, occur on the Faroes.

Among the *infectious* diseases, the Faroes are visited by only scabies, influenza, typhus, and in the last year, syphilis. Since we have not so far mentioned the latter disease, we shall here discuss briefly the effect on mortality which may be attributed to it.

Scabies, as is well known, hardly ever shortens the life, and so

will receive no further mention here *Epidemics of influenza* (*krujm*) are frequent, however, and as it appears, sometimes quite severe. The minor epidemic which I had a chance to observe was very plainly seen from the following survey

	Died in 1838	Died yearly, according to an average reckoning for the years 1835-1845, inclusive
On Nordstromø	15 persons	10 $\frac{2}{11}$ persons
On Sydstromø	41 persons	23 $\frac{2}{11}$ persons
On Østerø	47 persons	27 $\frac{2}{11}$ persons
On Vaagø	12 persons	9 $\frac{2}{11}$ persons
On Sandø	13 persons	9 persons
The Northern Islands	32 persons	15 $\frac{7}{11}$ persons
Total	160 persons	96 $\frac{3}{11}$ persons

This considerable increase of deaths in the year 1838 can, as far as may be judged from the data found in the Church books and from verbal information, according to which the year 1838 otherwise presents nothing disadvantageous to which this increased mortality could be ascribed, obviously be due only to the frightful epidemic of *krujm*, or influenza. It is noticeable that the outbreak of such epidemics stands in close relationship with the arrival of the trade-ships, especially in the autumn. This cannot well be accidental, since the arrival of the first trade-ship may occur at very different times—sometimes in March, sometimes in April, sometimes, again, in May, and since, according to the statement of Bailiff Ployen, among others, in the 17 years he has resided on the islands it has happened invariably that 2 or 3 days after the arrival of the first ship such an epidemic has broken out, and in this wise the commercial managers and clerks were first attacked, then all Thorshavn, and later the remaining places of the country. Exceptionally, the epidemic occurs at other times of the year, also, as in August, 1846, during my sojourn on the islands. This epidemic, too, began a few days after the arrival of the ship, and got abroad in the manner just described. The disease manifested itself in the form of a catarrhal fever, with cold in the head and cough, in greater or less degree, and in the severer cases, also catarrhal

Measles on Faroe Islands in 1846 863

injection of the conjunctiva, and watering of the eyes. It ran its course in 8, or at the most, 14 days. As analogous herewith, I take the liberty of mentioning the queer familiar fact that on the Island of Saint Kilda a similar epidemic breaks out—likewise making its appearance with cold, cough, and catarrhal fever, every time a ship arrives.

Typhoid fever, called on the Faroes "*landfarsot*" (epidemic), prevails there off and on, to be sure, but certainly not so frequently as with us. The isolated situation of the districts makes it plainly observable that the disease is primarily of spontaneous origin, but is afterwards spread by contagion. In the latter part of September, 1846, an epidemic of *landfarsot* broke out in Vestmannhavn. Since, on account of the cessation of the measles at that time, I had only to await the arrival of the ship to return to Denmark, I was requested by the chief magistrate to take up my residence in Vestmannhavn, in order to treat the sick there, and to devise measures which might possibly prevent the spread of the infection. During my stay there, which lasted 15 days, I treated 14 patients who were suffering from a pronounced typhoid fever. Since it has been supposed that there is something individual about the Faroese *landfarsot*, as though it were a nervous fever *sui generis*, I shall here set forth in brief the symptoms which the patients who came under my treatment presented, and which, in my opinion, proved that the disease is nothing else than a typhoid fever in the course of which the putrid symptoms sometimes appear to be more conspicuously pronounced than they usually are with us. In all the cases there was headache, sometimes setting in at once, sometimes later, with giddiness, a stupid expression of countenance, ringing of the ears, and photopsis, dedolation of all the limbs, general indisposition, with great languour, nausea, and anorexia, as the first signs of illness. The cerebral symptoms increased rapidly, and among about half the sick, violent delirium was present incessantly while the disease was at its height. During the first days the patients complained of sleeplessness, later they slept nearly all the time. With all there were a considerable wasting away of the flesh and diminution of the powers during the progress of the disease, while it was

at its worst, most of the patients were affected with trembling of the hands, and mimic spasms were observed to pass over their faces. *Rubor fugax genarum* (fleeting redness of the cheeks) was observable with nearly all. Deep pressure upon the abdomen, especially in the caecal region, would cause a good deal of pain with 11 of the 14 sick. In all the cases, without exception, the tongue was heavily coated, especially in the center, where it was also dry, with several the coating of the tongue was brown or black, and was crusty and seamed with fissures, the bottoms of which were bloody. When the coating was loosened, sometimes diphtheretic or aphthous places were observable on the tongue, but it soon regained its natural appearance, and when fissures were present, these healed rapidly. In all cases there was a bitter or putrid taste in the mouth, appetite was entirely absent at first, but in convalescence returned with renewed force, all suffered from thirst, which was usually very severe. In about half the cases diarrhea, which with some was quite profuse, alternated with constipation, some suffered with constipation only, others with diarrhea only, and with but few were the dejections natural all the time. Nosebleed occurred in the outset of the disease with several, though not with the majority, of the sick, bloody diarrhea was noticed with only one elderly woman, but distinct petechiae, sometimes isolated, sometimes blended into large dark purple spots, were found with 3 patients. Those pale, faint (measles) *morbilli* resembling the exanthema of typhus, were present with more than half the sick, being especially apparent on the arms, breast, and legs. Several of the sick had, besides, a catarrhal cough, usually inconsequential, and dry noses, while the conjunctiva was quite conspicuously injected, particularly with older persons. After the illness, extreme weakness followed in all cases, but was worst and most persistent among old persons. In addition taciturnity, despondency, and morosity were marked, being particularly great in the first stage of convalescence. With all was noticed desquamation of the lips, and with some also a branny scaling-off of the whole body. Older persons were usually more severely attacked than young persons. This little epidemic, which did not carry off anybody during my

Measles on Faroe Islands in 1846 865

stay, evidently sprang up spontaneously, but it was afterwards quite apparent that it was spread by contagion, since, after isolation was effected, the disease was confined not only to the districts⁶ which had already been affected when I arrived, but during my stay, even to the invaded houses, and since in these, even, the persons who slept in a room apart from the sick either escaped entirely, or did not fall ill until later on, while those who had to sleep in the room with the patients were attacked immediately, one after the other

The same method as that used in Vestmannhavn is usually successful on the Faroes in hindering the spread of a typhus epidemic, and here the inhabitants' extreme dread of infectious diseases helps greatly. Since the disease seldom succeeds in spreading beyond the place where it spontaneously originated, and since such spontaneous occurrence is luckily not very frequent, typhus seems not to contribute much towards increasing mortality on the Faroes—at least, not so much as in other countries, where the inhabitants have more intercourse with each other and are less willing to undergo isolation

Syphilis was unknown on the Faroes until about 2 years ago; since that time about 20 cases have come under treatment. According to what I saw of the disease there, I may pronounce it simple syphilis, in that I saw nothing but superficial chancre, mucous tubercles, white surface sores on the neck, and syphilids, which belong especially to the exanthematic types. The only feature in which it seems to differ from syphilis as observed *en masse* here in the hospital is the predominant frequency of the mucous tubercles, which might perhaps be due to the character of the primary type which was transplanted to the Faroes. When the Provincial Surgeon, Dr. Regenburg, called the disease a leprous-syphilitic affection, I can explain this to myself by the fact that he perhaps regarded the mucous tubercles as leprous knots. In his latest report to the Royal College of Health I see, however, that he has changed his views about the disease, in that in this report he speaks of it only as syphilis. How much

⁶ The Faroese villages, or "*bojgd*s" lie spread out over the entire "home field", and the lesser groups of houses, of which the *bojgd* is composed, are called "*bylings*" (little towns)

the former freedom of the Faroes from syphilis has helped to make the rates of mortality more favorable cannot be determined for the present,—particularly when consideration is given to the connection in which this disease probably stands with scrofula and tuberculosis

Of still greater importance for the favorable rates of mortality of the Faroe Islands seems to be the fact that the islands have been, at least, in the years 1835–1845, inclusive, free from small-pox, scarlet fever, and measles

Small-pox last prevailed on the Faroes, as far as I know, in 1705, and at that time caused great devastation, in regard to which accounts are still current among the people, thus, it is narrated that the whole population of Skuø died out from it. At present it might be hoped that such a calamity might be at least partially prevented by vaccination. It is obvious, however, that the physical character of the country renders it peculiarly difficult to carry this out satisfactorily. It could scarcely be done in any other way than for the physician to divide the islands into perhaps 5 districts, and to look after the vaccination in one of these, by turns, each year, by making a double tour, so that he would manage to reach each village twice, with 8 days' interim—the first time to perform the vaccination, the second to learn the results. But it would be unreasonable to require such an inconvenience of the appointed physician without a corresponding remuneration, since, apart from other hardships, by such a long absence from Thorshavn as would be involved, he would lose a part of the income from practice that would be due to the medical practitioner. Thus much, at least, is clear,—that vaccination such as is now performed on the Faroe Islands is entirely unreliable and aimless. The fact is that it is delegated to a rustic to travel around in the country to vaccinate the children, he is provided for the purpose with vaccine and a needle, or lancet, and is instructed how to go about the operation. This rustic then engages in each village a man that can write, to inspect the children 8 days after vaccination, and to write to the provincial surgeon as to whether the vaccine has taken or not. However, since on the one hand, it is quite doubtful—in fact, in many cases,

Measles on Faroe Islands in 1846 867

even improbable—that the man who is to inspect the children has even seen a characteristic vaccine pustule, and on the other, since there is a question as to whether, to serve his neighbor or countryman, he is not capable of telling a slight falsehood, seeing that the inhabitants are often loth to have their children vaccinated, because they fear the grafting in of foreign diseases, and so on, it may easily be perceived what is to be expected of such control. If, then, a complete reform is to be effected on the Faroe Islands in regard to vaccination, as is certainly most desirable, especially if freer conditions of trade are to be expected, it will not only have to be undertaken by the physician himself, in dual trips, as suggested above, but it must also be carried through for all persons without exception, so that certificates of vaccination hitherto issued should excuse none from this slight operation.

Scarlatina has never, as far as I know, visited the Faroes, nor, probably, whooping-cough, though the latter is recorded in 1838 in some of the Church registers as a cause of death, for this information seems to have originated only from the fact that one or the other priest, during the prevailing influenza epidemic, mistook a violent catarrhal chest affection for whooping-cough.

The measles had not prevailed on the Faroes since 1781, then they broke out early in April, 1846. Since I intend to offer in another section some observations about this disease, I shall limit myself here to mentioning the effect of the epidemic on the mortality. Of the 7782 inhabitants, about 6000 were taken with measles, in the course of about half a year, in that the first cases appeared, in Thorshavn, on the 4th or 5th of April, and after the 17th of September only a few cases were, as yet, occurring on Sandø. From the beginning of the year to the middle of September 255 persons in all died, of whom at least 102 died of measles or its *sequelae*. But since I have no very accurate statistical data for Suderø, which Mr. Manicus has taken care of, I shall here give account only of the other islands, comprising 6 parishes, with 6626 inhabitants, of whom about 5000 had measles last year. From the beginning of the year 1846 until the epidemic had ended, 215 persons died in these parishes, among whom 164

died under the epidemic, the duration of the latter being calculated separately for each village, and of these 78 were victims of measles or its results. It must, however, be observed withal that the number of those who died of measles, as far as Sydstromø is concerned, seems to be set too low. The fact is that for this parish I was able to refer only to the records which I found in the Church registers, where measles is given as the cause of death in but twelve instances. But if the Church registers also show that of 68 individuals who died on Sydstromø from the first of the year to July 30, 64 died between April 21st and July 21st, and so just in the space of time during which the measles prevailed there, whereas, according to the average count for the years 1835-1845, inclusive, only $23\frac{1}{11}$ persons usually die yearly in Sydstromø, it is unlikely that only 12 should have been taken off by measles. This is the more extraordinary, because of the 64 dead, 45 had lived in Thorshavn (which had about 800 inhabitants), where both the physicians of the country live and, in accordance with instructions, report the causes of death to the priests, who record them in the Church registers. In all the other parishes where I had been able, by dint of personal presence, to obtain more reliable information, it was found that between a third and a half of those who died in the course of the year were carried off by measles or its *sequelae*, except in Sandø, however, where the measles demanded *no sacrifices*. Therefore, even if we ascribe to an epidemic beginning with the arrival of the ship some effect upon the mortality, it appears to me as probable that the actual number of deaths from measles was between 78 and 164, in the first case, there would have been 1 death among 64 measles patients, and in the other, 1 among $30\frac{1}{2}$. While the ratio of deaths to the total number of people, which in Denmark is, according to the average calculation for 1801-1834, $1\ 41\ 22$, for the Faroes, according to the average computation for 1835-1845, is usually $1\ 64\ 66$, it is here found to be $1\ 31\ 107$ in only the first two-thirds of the year 1846.

It is a remarkable fact, indicative of the serious character of the measles among the grown people, that the yearly average age of death was practically unaltered— $44\frac{1}{8}$ years (usually

Measles on Faroe Islands in 1846 869

44 $\frac{2}{3}$ years) The following conspectus may serve to show the rate of mortality in the respective ages during the measles epidemic of 1846, and for a comparison of these rates with those usual on the Faroes

	From 1835-45, inclusive, died yearly, by average computation at the respective ages	In the first two-thirds of the year 1846 died	Per cent of persons of the respect ages taken by death yearly, reckoned from the census for 1835-45 incl	Per cent of persons of the respect ages died in first two-thirds of 1846, counted from census of 1845 and my own notes	Number of times mortality in first two-thirds of 1846 was greater than that usual in an ordinary whole year
			per cent	per cent	
Under 1 year	18 $\frac{1}{11}$	50	10 $\frac{8}{11}$	30	About 2 $\frac{9}{11}$
Between 1 and 10 years	7 $\frac{1}{11}$	6	$\frac{6}{11}$	$\frac{9}{11}$	About 0
Between 10 and 20 years	5 $\frac{1}{11}$	5	$\frac{5}{11}$	$\frac{7}{11}$	About —
Between 20 and 30 years	6 $\frac{6}{11}$	8	$\frac{12}{11}$	$\frac{12}{11}$	About 1 $\frac{4}{11}$
Between 30 and 40 years	6 $\frac{2}{11}$	13	$\frac{12}{11}$	2 $\frac{7}{11}$	About 2 $\frac{1}{2}$
Between 40 and 50 years	7 $\frac{4}{11}$	18	1 $\frac{1}{11}$	2 $\frac{8}{11}$	About 2 $\frac{1}{2}$
Between 50 and 60 years	5 $\frac{5}{11}$	28	$\frac{10}{11}$	4 $\frac{8}{11}$	About 5
Between 60 and 70 years	8 $\frac{2}{11}$	31	2	7 $\frac{8}{11}$	About 3 $\frac{1}{2}$
Between 70 and 80 years	14 $\frac{10}{11}$	30	6 $\frac{5}{11}$	13 $\frac{1}{11}$	About 2
Between 80 and 100 years	16 $\frac{9}{11}$	26	16 $\frac{9}{11}$	26	About 1 $\frac{1}{2}$
Total	96 $\frac{3}{11}$	215			

This conspectus shows that the measles, perhaps in connection with the epidemic of influenza which prevailed with it in the spring, was destructive to the young child under 1 year of age, but on the other hand, did not remarkably increase the mortality between the first and twentieth years of life, because the disease was less dangerous in this period, but that the mortality rose from the 30th year, until it became greatest for the age between 50 and 60 years, that is, 5 times as great as usual, besides which, it then descended again after the 60th year—not because the disease was less dangerous for those still older, which was by no means the case, but because it was precisely 60 years before that the measles had last prevailed on the Faroes, and those who had recovered from the disease at that time were now immune

The following conspectus shows the extent to which the epidemic of measles prevailed on the Faroes, although the difference

which must be apparent from the fact that no age was spared, while in Denmark, to be sure, the measles usually attacks only children, is a contributing factor towards making the rate of mortality for 1846 more like the rate with reference to Denmark than usual. Accordingly, it might appear as if the singular way in which the measles affected the mortality rates on the Faroe Islands had something in common with the way in which the numerous different epidemics prevailing at the same time affected the mortality of Denmark and other countries.

The influence which the epidemic of measles of 1846 exerted on the mortality rates of the Faroes may serve as an example to illustrate the tendency of epidemics as a whole towards decimating the populations of countries. Of course, the measles is not wont, under usual conditions, to menace any but children, while on the Faroes it evidently attacked almost the entire population, without respect to age, but the epidemics in the aggregate which prevail in other countries but partially spare the Faroes, also threaten the entire population, without respect to age. I believe that it has held good in every case that the most essential cause of the favorable rates of mortality on the Faroes may be looked for in the freedom of these islands, because of their situation as well as their isolated condition as regards commerce, from many diseases which in other places—Denmark, for instance, very considerably increase the mortality. It is obvious, then, that prophylactic measures against the introduction and spread of foreign disease are of very great importance in such places, where they can be put into execution, as, for example, on the Faroes, while they are of no importance where they are rendered impracticable by a great conflux of people and by other conditions, as in Copenhagen. Here, therefore, an edict of quarantine against the measles would seem ludicrous, but the Faroe Islands would probably not have lost nearly 100 inhabitants if an edict directed against the smuggling in of the measles had not been removed some years ago.

II

The measles is a disease so generally familiar and so almost trivial that it might be supposed that observations in regard to it

could offer nothing new, except in special cases with more or less rare complications. It is not, however, my intention here to go into details which are of only more or less partial interest, but to offer some observations in regard to the nature of the contagium of measles, which peculiarly favorable circumstances rendered it possible for me to make, and which I believe merit some attention.

As to the length of the incubation period, accurate and satisfactory observations have hitherto been lacking, as far as I know, since some authors regard it as 8 days, others as from 10 to 14 days, while others again, assume no definite stage at all of latent contagion. This may not be strange, however, since observations in regard to the subject could not well be made where a very lively intercourse goes on among the people, and where each individual comes into contact with a large number of other individuals, each of whom may be carrying the germs of infection with him. Here in Copenhagen for instance, it can very rarely be said of a measles patient that he was exposed to infection only once, on this or that day, since it can hardly even be proved that he was not in anywise exposed earlier or later, without knowing it, to the influence of the contagium of measles. To be able to arrive at some definite result in reference to this question would call for special circumstances which might render it possible to make accurate observations, and these circumstances were offered on the Faroe Islands. The isolated situation of the villages, and their on the whole limited intercourse with each other, made it possible in many, in fact in most cases, to ascertain where and when the person who first fell ill had been exposed to the infection, and to prove that the contagion could not have affected him either before or after the day stated.

The first person on the Faroes who took the measles was a cabinet-maker, now living in Thorshavn. He left Copenhagen on the 20th of March and reached Thorshavn on the 28th, on the way he had felt quite well, but was attacked by measles early in April, on what day he did not know. Shortly before his departure he had visited some measles patients in Copenhagen. About 14 days later his two nearest associates were attacked

These facts, although inaccurately observed⁷ to be sure, which were related to me before my departure from Thorshavn, determined me to give attention in my travels about the islands to the length of the stage of incubation

The first village to which I came (on July 2) on my rounds was Tjørnevig, on Nordstromø, where 80 of the 100 inhabitants were down with the measles. On the 4th of June a boat with 10 men from Tjørnevig had taken part in a catch of *grinde*, at Vestmannhavn, and on precisely the 14th day following, the 18th of June, the measles exanthema broke out on all 10 men, after they had been feeling ill from 2 to 4 days, and had been suffering with coughs and smarting of the eyes

	Mortality on the Faroes (except Suderø) in the first two-thirds of the year 1846, reckoned on 1000 individuals, instead of on the actual mortality of 215	Mortality in Denmark in the years 1828-33 incl reckoned for 1000 males	Mortality on the Faroes (except Suderø) in the years 1835-45, incl reckoned for 1059 individuals of whom 60 were stillborn or died within 24 hours
Under 1 year	233		199
Between 1 and 10 years	28	366	80
Between 10 and 20 years	23	43	60
Between 20 and 30 years	37	56	72
Between 30 and 40 years	60	60	68
Between 40 and 50 years	84	77	81
Between 50 and 60 years	130	105	60
Between 60 and 70 years	144	123	90
Between 70 and 80 years	140	113	164
Between 80 and 100 years	121	57	185

The 10 men mentioned had not been together at all except at the *grinde*-catch referred to, and none of them had been at any place where they could have happened to be exposed in the remotest way to the infection, which they dreaded and shunned. In Vestmannhavn, on the other hand, they had not only been in contact with many men who had recently got up after the measles, perhaps part of them still florid with the exanthema, but had also been staying later in houses where persons had to go to bed on

⁷ Dr Regenburg, Provincial Surgeon, who was the cabinet-maker's physician, was ill himself at the same time at which the former's illness was at its height, which, as well as the surgeon could remember, was on April 4th

Measles on Faroe Islands in 1846 873

the next day with an eruption of the measles exanthema From 12 to 16 days after these 10 men had taken measles (counting from the appearance of the rash), the rash of measles broke out among nearly all the other inhabitants, except perhaps some few individuals, who were not attacked until 12 or 16 days after the first general attack

These facts might suggest that the contagium of measles produces no visible effects for quite a long time, usually 10 or 12 days, after its reception into the organism, since the precursory catarrhal stage began just after this lapse of time, and that the exanthema first appears on the 14th day after the reception of the infective matter If this supposition was confirmed, then the observation that the second and third general attacks ensued each after about 14 days' interim, would make it probable that the measles is most infectious during the stage of eruption and efflorescence, not, as generally supposed, during that of scaling off

In order to investigate as to whether these suppositions were well-founded, I decided to undertake in each village to which I came a minor examination, as exact as possible, in regard to the origin, occasion, and propagation of the disease. In this way I obtained from 52 villages the names of the persons who took the measles first, the opportunity whereby and the date whereon they were exposed to infection, the date on which the exanthema came out on them, and the time that elapsed thereafter before the other residents broke out with the rash It would have been too tedious, however, to go through with such an examination in every single village, especially as I found the supposition set forth above confirmed on the whole, and I did not come across any cases to prove that there were exceptions to the rule I shall, therefore, present here only some cases by which this fact was confirmed in most remarkable fashion

In *Velberstad*, on Sydstromø, I obtained statements which combated my assumption of a stage of incubation of a definite length, inasmuch as there appeared to have been, in the case of a certain patient, only 10 days between the occasion on which the patient was exposed to the contagium and the day on which the rash appeared Since it was a very reliable man who stated this

to me, and the patient concerned was his own wife, I thought I had here found an exception to the rule. But on St. Clave's Day (July 29th) the same man sent me a message by his nephew, Pastor Djurhuus, to the effect that his statement had not been correct, but that it was exactly 14 days, instead of 10, that intervened between the occasion on which she broke out with the rash. Shortly before my arrival the man had lost at the same time a beloved wife and a sister, and his grief had distracted him.

The other cases in which I thought I found an exception to the rule was in Hattevig, on Fuglø (Bird Island). A young man, the first who had taken measles there, declared to me that he had not been outside Hattevig except on Whitmonday (June 1) when, together with another man, he was in Annefjord, on Bordø (Table Island?) where at that time the measles had not broken out, but where he had later learned, a man had got the rash on the 3rd of June, and two others on the 8th.⁸ The first young man asserted that in his case the exanthema had appeared on the 11th of June, but in his companion's not until the 14th. Although I represented to him that it was of great importance to other people that he should tell me the truth, and there was no question of any responsibility for him, he would not admit that he had been exposed any earlier to the infection. But in the evening when I was sitting in the smoking-room, attired in Faroese clothes, he came to me and begged my pardon because he had not recollected correctly, the fact was that he had also been in Klaksvig, on the 30th of May, and being in an intoxicated condition, had been in several houses where there were cases of measles. The form somewhat resembling an examination which I had used had made the young man from that isolated Fuglø uneasy, and had induced him to divulge the truth.

In *Selletraed*, on Østerø (Eastern Island) I was told that a young man had been infected on June 4, at the *grinde*-haul in Vestmannhavn, and that on June 9 he had broken out with the

⁸ This was related correctly. One man had been at the trading-place, Klaksvig, on the 20th of May, where the measles was prevailing, and he broke out with the rash on June 3rd, the two others had been at the same place on the 25th of May, and the rash appeared on them on June 8th.

Measles on Faroe Islands in 1846 875

rash, and that his younger brother and other folk in the village had been infected by him, and had broken out with the rash on June 17 I asked for the almanac, and inquired where the elder brother had been on the 26th of May (14 days before the exanthema broke out on him) They told me that on that very day he had been in Nord-Øre, where the measles was prevailing, and that on the way home he had spent the night of the same day in Sydre-Gothe, and had slept in the bed with the servant-man of P Johnsen's widow, but that in Nord-Øre he had not been in any house, and there was no measles in Sydre-Gothe at that time However, by looking at my notes afterwards, I found that the servant-man mentioned was the first person who took the measles in Sydre-Gothe, and that the exanthema had spread over his whole body a few days later Then I learned that only those folk in the village who had broken out with the measles rash at the same time as the brothers had been along with them at the *grinde*-catch at Vestmannhavn It was now clear to me that the eldest brother had been infected in Gøthe (or possibly in Nord-Øre), and the youngest, together with the second brother, in Vestmannhavn

In *Fuglefjord* (Bird Fjord), on Østerø, I had the reputation of being able to prophesy, on account of my observations On my first arrival there, the daughter of Farmer J Hansen, churchwarden, had recently had the measles, but had then got up, and except for a slight cough, was almost entirely well All the 9 other persons in the house were feeling well in every respect, and expressed the hope that they would escape the disease I inquired as to what day the rash had appeared on the daughter, asked for the almanac, and pointed at the 14th day after that on which the rash had been noticed on the daughter, with the remark that they should make a black line under that date, for I feared that on it the measles would show itself with the others in the house, if this did not happen, they might perhaps have some hope of being exempt As it turned out, I was summoned to Fuglefjord again 10 days later, and was met with the outcry "What he said was correct! On the day he pointed out the measles broke out, with its red spots, over all 9 of them!"

Since on my first round, I had found my suppositions confirmed in the 13 villages which I inspected, I felt it my duty to impart them to my colleagues, Dr Regenburg, Provincial Surgeon in Thorshavn, and young Dr Manicus, who way staying on Suderø. Both have since told me that they, too, have found these suppositions confirmed in their practice, without feeling assured, however, that there were no exceptions to the rule. The young medical practitioner, Dr Nolsøe, likewise assured me that he had everywhere found the observations cited confirmed in his practice, except at Skaalevig (Fish Cove), on Snadø, where the general rule did not hold good at all, and where it was impossible to descry any definite incubation stage or any rule for the outbreak of the disease. On the 24th of September, however, I came to Skaalevig myself, and so was in a position to acquire accurate information about these things and I learned the following facts. Dr Nolsøe had been at Skaalevig 3 times before Whitsunday, because a severe epidemic of influenza was prevailing in the village—the first time on the 5th, the second on the 12th, and the third time on the 18th of May. On the 19th of May one of the men who had been to fetch the physician the first time broke out with the measles exanthema, and on the 25th, one of the men who had fetched him the second time. The first man who took the measles had a sister, who was a servant of the wealthy farmer J Dahlsgaard. In spite of her husband's interdiction, she had gone to see her brother, and she broke out with the rash on the 2nd of June (14 days after the brother), another maid-servant of the same farmer had visited the other man, who had developed the measles exanthema on the 25th of May, and she broke out on the 7th of June. Then the mother of the family developed the exanthema on the 16th of June (14 days after the first girl), 3 children and 2 servant-men, on the 20th of June (13 days after the second girl), the husband, the 30th of June (14 days after the wife), the eldest daughter, the 4th of July (14 days after the younger children), and the eldest son on the 7th of July. In several houses where I sought for information about the origin of the measles, I learned that first a servant girl or a servant man, whose family had measles, had been infected, and 14 days after-

ward one, or probably several, in the house had broken out. Closer investigation showed, then, that Skaalevig, far from offering any exception to the rule, provided, on the contrary, a very complete example of the constant length of the stage of incubation, and of the fact that the measles is most infectious during the period of efflorescence. The only deviation from the rule generally observed was the slower spread of the disease in Skaalevig than in the other towns, and this might seem strange in view of the fact that the residents of Skaalevig were generally said not to shun the infection of measles at all. Thus the natural explanation of this difference is apparent on a nearer observation of conditions. For Skaalevig is one of the most widely scattered of the Faroese villages; the houses either stand isolated out in the midst of the field, or two or three grouped together, in the largest "byling" (group of houses), with 6 houses, the measles had made its complete round when I arrived. The dwelling of Farmer J Dahlsgaard, in which the very slow spread of the measles was most extraordinary, is distinguished for its size and roominess, together with the fact that the bedrooms in it are separated farther from each other than in most others—in fact, than in any of the rest of the Faroese houses. Another important circumstance I found in the fact that the people in Skaalevig, as I was assured everywhere, had, especially in the beginning, been careful to the extent that residents of the houses which were still free from the disease had not gone into the houses where there were sick persons, and that the heads of the families had instructed their children and domestics to avoid intercourse with those of the infected houses. But at work and when meeting in the open air, the people from the well and the infected houses had not avoided intercourse with each other, and so it came to be said that the inhabitants of Skaalevig did not shun the infection of measles, which thus, strictly speaking, was not correct. A third circumstance, which was observable particularly towards the wind-up, was the unmistakably decreasing intensity of the infection as the cessation of the epidemic drew near. In conformity with this observation, the disease attacked very slowly in Kuno, Midtvaag, and Sandevaag. In these places it did

not happen, as at Tjørnevig, for instance, that while the epidemic was at its height, about 14 days after one or several persons had caught the measles, the majority of the residents of the village were attacked, while only a relatively small number were spared until 14 days after the great onset, but the people in the last-named villages fell ill gradually, so that only a few were attacked 14 days after those who took the disease first, 14 days later, others, about 14 days after these, others, again, and so on, thus the disease lingered longer in the villages last attacked than in those that were infested earlier. Nevertheless the measles preserved withal, at least as far as my experiences went, their definite period of development (from the reception of the infection to the appearance of the exanthema), and I know of no case, in fact, where, after a pause of more than 14 days, the measles had appeared afresh in a village without a new infection having occurred from some other place. However, we cannot deny the possibility that the infective material may be retained for quite a while after the cessation of the measles, in wool or clothing, for instance, or other things that are susceptible of harboring it.

The rule that the contagium of measles does not for a considerable time after it has been received into the organism, produce any symptoms of illness at all, and then after an indefinite prodromal period—according to my experiences, always the 13th or 14th day brings forth the well-known exanthema, has thus, in an important series of accurate observations proved constant for me. It cannot of course be denied that, in addition, the constitutions of patients, their diet, etc., may be contributing factors towards hastening or retarding the eruption of the exanthema, but these differences are not nearly so great as might be expected *a priori*, for it appears that these external conditions are never able to hasten nor to retard the eruption of the rash more than about 24 hours beyond the normal time for it. At any rate, I think that, after my observations of the outbreak of the measles in 52 different towns, where I always found the above-cited rule steadfast, though often with various *dates* for a single town, I am justified in asking that exceptions to the rule (the occurrence of which I can be no means deny, though I have not seen them)

which might be cited in opposition to my assertions, be accurately observed, and that they should be of such nature as to be demonstrable. For the examples given show clearly enough that, on more accurate investigation, apparent contradictions of the rule often serve to establish it more firmly than ever. In most of the alleged cases, I myself felt shaken in my faith as to a constant period of incubation, but in every instance my doubt vanished with a more precise investigation. The analogy here with the information which has been acquired concerning the stage of incubation of smallpox, of 14 days between the reception of the contagium and the appearance of the eruption, imparts to these observations, it seems to me, still more significance.

A circumstance which may easily create confusion in these investigations is the indefinite length of the prodromal catarrhal stage. For some patients suffered for 6 or 8 days before the eruption of the exanthema, from cough, pain in the eyes, and slight fever, others, only from 4 to 6 days, the majority from only 2 to 4 days, and in many light cases the precursory period was either entirely lacking, or lasted from only 1 to 2 days. It is better not to ask the patients, then, when they become ill, but when they broke out with the rash, if it is expected to be enlightened as to the time which the contagium requires to develop the exanthema.

If it is now regarded as a rule that the contagium of measles requires between 13 to 14 days after its reception into the organism to develop the exanthema, and as numerous experiences like those which established this rule show, that there are generally exactly 13 or 14 days between the time at which the rash appears on the patient and that at which it breaks out on his infected associates, it is then clear that the persons who are infected by him received the contagium into their organisms at precisely the time when the rash was breaking out or had just appeared on him. Hence it is at least plain that the measles does not infect as long as the contagium is still lying latent, without producing any symptoms of illness. Whether it may be regarded as infectious in the precursory catarrhal stage, shortly before the eruption of the exanthema, it is hard to decide. I

saw not a few cases in which it was to be supposed from the patients' statements that they had only been in contact with persons who had prodromi, but not yet exanthema. The example cited of the young man from Fuglø who was infected in Annefjord and the man from Selletraed who was infected in Gothe might, for instance, go to prove this. But since I so often saw persons have a good deal of rash on their faces without even knowing anything at all about it until I showed it to them, many first becoming aware of its presence when, after several days' preliminary course, it had broken out over their whole bodies, I do not believe that it can be accepted as certain that the measles sometimes infects before the eruption of the exanthema. At least, the cases observed by me which might seem to corroborate such a belief were of such a nature that it could not be positively asserted that there was no exanthema present on the infected persons, for in every case the rash had developed over the entire body a day or a few days later.

It has generally been maintained that the measles is most infectious during the period of desquamation. I do not suppose that such a view was arrived at from observing that the infected associates of a measles patient first broke out while the patient was in the stage of desquamation. Now if the observer is not familiar with the disproportionately long period of latency of the contagium, it is natural that he should assume that the infection was transmitted by the first sick person at a later period than was actually the case. It was not possible for me to find any case which could prove that contagium may really be given off during the stage of desquamation, but just as little can I prove that infection may not occur in this stage.

In some villages certain young persons who had not taken measles earlier and were constantly exposed to the infection remained quite exempt, being infected neither by the patients who had the rash nor by those who were scaling.

I think, however, in regard to the rule laid down that 13 or 14 days intervene between the reception of the contagium and the eruption of the rash, that I may assert thus much. In the majority if not all the cases the infection proceeded from the measles

Measles on Faroe Islands in 1846 881

patients while the exanthema was breaking out or had just appeared, and no case was known to me in which a person took measles more than 14 days after the exanthema had disappeared from the persons who might be supposed to have transmitted the infection to him. It is not impossible that the reason for this consists partly in the fact that the associates, as it were, of the measles patients who were susceptible to infection had *already* been infected by him while he had the exanthema, and so could not be infected while he was desquamating, but it is certain that the measles is extremely infectious during the eruption and the period of efflorescence, whereas its infectiousness in either the stadium prodromorum or the period of desquamation is doubtful. Whether there is a connection here with the exhalations from the patient, which are strongest, and the peculiarly acrid odor of which is most characteristic, under the eruption and on the first day of the efflorescence, I cannot positively say, but the supposition seems to me very reasonable.

At the instigation of the provincial surgeon, Dr. Regenburg, I vaccinated 60 children on one of my rounds, to see whether the slight fever which attends the vaccine sickness stood in any inimical relation to the measles, but I came to the conclusion that there is no relationship at all between the vaccine fever and the measles, but that the two affections may be developed simultaneously. I made no experiments with inoculation of measles, since I could expect no results with persons who had evidently been exposed to the contagium of measles, and with those who had not been exposed to infection, I feared that I might do more harm than good. It is known to be generally supposed that measles sometimes attacks one and the same individual twice. In this connection it is quite remarkable, however, that of the many old people still living on the Faroes who had had the measles in 1781, not one, as far as I could find out by careful inquiry, was attacked the second time. I myself saw 98 such old people, who were exempt because they had had the disease in their youth. This was the more noteworthy in that a high age by no means lessened the susceptibility to measles, since, as far as I know, all the old people who had not gone through with the measles in

earlier life were attacked when they were exposed to infection, while certain young persons, although constantly exposed, were exempt. If recovery from measles 65 years before could insure people against taking it the second time, it might be supposed that still greater protection would be afforded, by having recovered from it a shorter time since, and I am, therefore inclined to assume that the cases in which measles was observed to occur the second time with the same persons were erroneously diagnosed, or at least were extremely rare.

Opinion has been divided as to the degree of intensity which should be credited to the infectiousness of measles. As a contribution towards the solution of this question, the following cases would seem to be not without interest.

On the 2nd of June a boat set off from *Funding* for the trading-place, Klaksvig, to fetch wares. These traders were not permitted to obtain goods, however, unless they would help to unload grain from the transport-ship, which had just arrived from Thorshavn. On board ship there were men who had just recovered from the measles, and the business clerks in Klaksvig were just coming down with it. The men from Funding, who had been down in the hold and in the warehouses, but had not, however, been among those who were sick with measles, after they had arrived at home, threw away all the paper that was around their goods, undressed completely in a *kjæld* (an outhouse intended for drying fish) washed themselves all over with water, put on clean clothes, and threw into water all the clothes they had been wearing. None of these men took the measles until July 3, when the whole village had already been attacked. On June 3 another boat set out from Funding, in company with a boat from Nordre-Gjov, for the trading place. In order to obtain goods, the men from these boats had to load the ship with dried fish. A man from Funding became ill and had to go into a house—into a room, in fact—where several persons lay sick with the measles, the other men from Funding and the men from Nordre-Gjov were only in the ship's hold and in the warehouses, where they stood close against other people, among whom there was a man from Nord-Øre, which had been invaded by the measles. After their return home, the men from Funding like

Measles on Faroe Islands in 1846 883

those who had been in Klaksvig with the first boat, went on with their work, and not one of them was taken sick until the whole village was attacked. The men from Norde-Gjov, who had not gone through with the same careful cleansing after arriving at home, all broke out with the rash about 14 days afterwards. On June 8 a third boat from Funding was in Klaksvig, there the commercial clerks and shop people had just recovered from the measles, and there were some people from Leervig in town, who were out for the first time since their recovery from measles. The men from Funding were in close contact with both the shop people and the Leervig folk. Although on returning home, they took the same precautions as those who had previously been there on business from Funding, they all, except a woman (not pregnant), were taken with measles and broke out with the rash about 14 days later.

Kvalvig, on Nordstromo, was one of the villages where the people most dreaded the measles. Willing as the Faroese generally were to convey me farther on my itineraries, and to be obliging to me, in *Kvalvig* they were so afraid of measles that they almost refused me conveyance to Vestmannhavn, and when I got their consent to take me, the man who carried my things, kept at a long distance from me, and the man who drove the horse had wrapped his head up in a large handkerchief, and kept always at least 3 feet away from me. This was strange, for the Faroese are usually wont to be satisfied that the physician never carries any infection with him, but the explanation of their fear was to be found in the way in which the measles had been brought to *Kvalvig*. The fact was that 3 weeks before Whitsunday the provincial surgeon was summoned to *Kvalvig*, where a severe epidemic of *krujm* was prevailing, and he had to spend the night in the village. In the house in which the surgeon had slept, the measles broke out exactly 14 days after his arrival. No other occasion than his visit could be assigned for the outbreak of the disease, since no resident of *Kvalvig* had been in any suspected place, and particularly none of those who lived in the house that was first attacked, and since no other stranger from any of the affected or suspected places had been in the village.

From *Fuglefjord*, where I had visited many patients with the

measles, I was summoned to Mygledahl, which was still exempt. Since 8 men had ventured, notwithstanding their fear of the disease, to come to fetch me for a woman, who must have been very ill, it was my duty to do what was in my power to avoid carrying the measles to Mygledahl. On my arrival, in the middle of the night, I, therefore, undressed in an outhouse in which fish were dried, and put on a suit of clothes which I had not had on among the measles patients. Mygledahl was not attacked by measles afterwards.

To *Midtvaag*, on *Vaagø*, the measles came, so people said, with the midwife, who had passed several days with the measles patients at *Steedgaard*. The woman had had the disease herself in Denmark. In all the houses in which the midwife had been, they said, the measles appeared 14 days later, and a girl who washed the midwife's clothes immediately after her arrival was the first who took the measles in *Midtvaag*.

These examples, which seem to prove that the contagium of measles may be carried about in clothing worn by persons who are not themselves susceptible to infection, apparently give evidence of an intensity of contagiousness which would hardly otherwise have been attributed to the measles. It might have been supposed, for example, that the contagium with which the physician's clothes were impregnated would be blown away on a 4 miles' trip in an open boat, especially when the weather through which he traveled was inclement with wind and rain. Moreover, the cases cited in regard to the residents of *Funding* on their business trips appear to prove that prophylactic cleansing after exposure to infection may sometimes protect.

That the surest means of hindering the propagation of the disease, however, is to maintain quarantine is quite beyond doubt. In this way, by isolating houses, success has been attained in many villages in preventing very general dissemination of the disease. Thus, in *Saxen* 2 houses were saved from measles, in *Midtvaag*, 10, in *Sandevaag*, 10, in *Gaasedahl*, 2, in *Glibre*, 2, in *Funding* 1, in *Fundingbotn*, 1, in *Nordskaale*, 1, in *Selletraed* (at least at my arrival), 4, the half of *Thorsvig* and *Lambevig*, the greater part of *Kvalvig*, *Skaapen*, and part of *Skaalevig*. By

Measles on Faroe Islands in 1846 885

cutting off communication with infected places, the residents of the following places succeeded in keeping the measles entirely away, Haldersvig, with 102 inhabitants, Eldevig, with 85, Andafjord, with 121, Viderø, with 101, Mygledahl, with 66, Trollenaes with 29, Husum with 54; Blankeskaale, with 51, Skare, with 26, Skaaltofte, with 19, Myggenaes, with 99, Skuø, with 61, Sands, with 240, Husevig, with 52, Skarvenaes, with 26 And so by maintaining quarantine, about 1,500 of the inhabitants of the Faroe Islands were saved from measles

If, among 6,000 cases, of which I myself observed and treated about 1,000, not one was found in which it would be justifiable, on any grounds whatever, to suppose a miasmatic origin of the measles, because it was absolutely clear that the disease was transmitted from man to man and from village to village by contagium, whether the latter was received by immediate contact with a sick person or was conveyed to the infected person by clothes, or the like, it is certainly reasonable at least to entertain a considerable degree of doubt as to the miasmatic nature of the disease

Since it was possible everywhere to lock the doors, so to speak, against the disease, it is, in my opinion not only theoretically justifiable to regard it on the whole as a contagious disease, but practically even necessary to do so For if people think that the causes of the disease must be sought for as *generally dispersed in the atmosphere*, they can have no hope of protecting themselves against it, and will not be disposed to institute measures in this respect, since such measures must be regarded as vain, but if it is considered as settled that the measles is transmitted only to such individuals as are susceptible to the infectious material which every measles patient carries, whether the infectious matter is suspended in the air most nearly surrounding the sick person, or is entangled in clothes and the like, there may be hope of setting limits to the propagation of the disease, and the necessary provisions in this direction will be instituted with reasonable hope of a successful result There are certainly many physicians who have the same views in regard to the miasmatic contagious character of the measles which the two physicians of the Faroe Islands

had when the measles arrived in the country Since the people were convinced that the seeds of the disease would be carried through the air from house to house, from village to village, and from island to island, they did not think the trouble worth while to undertake an isolation, whereby the disease would probably have been limited to quite a few houses Experience had, however, taught a part of the inhabitants in 1781 that the spread of the measles could be hindered by isolating places or even houses, and the old people, who had preserved the recollection of this from their youth, effected in many places, as mentioned above, on their own responsibility a sort of quarantine, whereby the places concerned were entirely or partially spared Not until later on, when experience had also taught the physicians of the country that the infection is quite obviously carried from place to place by persons and does not jump about, did they, too, begin to dissuade from communication with the infected houses and places, but the disease had then already been spread over the entire country, and it was too late, from the public viewpoint, to institute serious measures towards isolation Experience in regard to the fact that the measles is not miasmatic but purely contagious in character has been so dearly bought on the Faroe Islands that the people there will probably be agreed with us hereafter that it is correct, at least in practice, to consider the measles as a contagious and not a miasmatic nor miasmatic-contagious disease

It is another question as to whether, under very special circumstances, the measles may originate spontaneously This did not happen on the Faroe Islands, and if it ever does happen, a contingency the possibility of which from a theoretical standpoint, in analogy with typhus and the like, cannot well be denied, yet such cases are so rare that with respect to the regulations which, especially under conditions such as those on the Faroe Islands, Iceland, and other isolated places, people might feel themselves called upon to institute against the dissemination of the disease, they need not be taken into consideration

MEDICAL CLASSICS

VOLUME III



THE WILLIAMS & WILKINS COMPANY

BALTIMORE, MARYLAND

1938-39

WAVERLY PRESS, INC
BALTIMORE, MD

Contents of Volume III

Hippocrates		
Introduction		III
Oath		VIII
On Ancient Medicine		I
On Airs, Waters and Places		19
The Book of Prognostics		43
On Regimen in Acute Diseases		60
Of the Epidemics		100
On Injuries of the Head		145
On the Surgery		161
On Fractures		171
On the Articulations		210
Mochlicus		278
Aphorisms		299
The Law		331
On Ulcers		333
On Fistulae		345
On Hemorrhoids		351
On the Sacred Disease		355
Halsted, William Stewart, Portrait		384
Biography		385
Bibliography		388
Cure of Inguinal Hernia		412
Cure of Cancer of Breast		441
Bernard, Claude, Portrait		512
Biography		513
Bibliography		518
De l'Origine du Sucre		552
Du Suc Pancréatique		581
Adams, Robert, Portrait		620
Biography		621
Bibliography		622
Cases of Diseases of the Heart		633
Cheyne, John, Portrait		698
Biography		699
Bibliography		700
A Case of Apoplexy		705
Stokes, William, Portrait		710

Biography	711
Bibliography	713
Cases of Permanently Slow Pulse	727
Fatty Degeneration of the Heart	739
Buck, Gurdon, Portrait	748
Biography	749
Bibliography	750
"Extension"	762
"Fascia"	783
"Operation"	790
Panum, Peter Ludwig, Portrait	802
Biography	803
Bibliography	804
Measles on the Faroe Islands in 1846	829
Jackson, John Hughlings, Portrait	888
Biography	889
Bibliography	890
Defects of Sight in Brain Disease	918
Loss of Speech with Hemiplegia	927
Cases of Nerve Disorder	930
Divisions of the Central Nervous System	936

MEDICAL CLASSICS

VOL 3

June, 1939

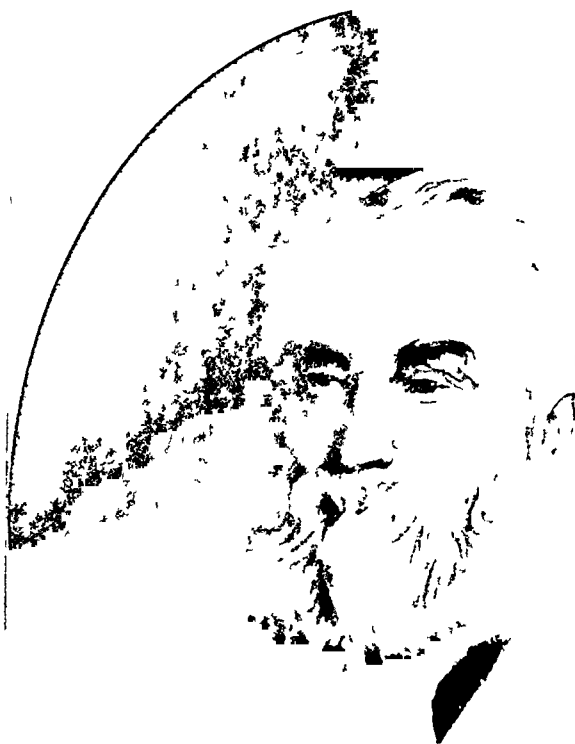
NO 10



CONTENTS

Portrait of John Hughlings Jackson - - - - -	888
John Hughlings Jackson - - - - -	889
Biography - - - - -	889
Eponyms- - - - -	890
Bibliography of Writings- - - - -	890
Introduction - - - - -	915
Observations on Defects of Sight in Brain Disease J Hughlings Jackson - - - - -	918
Loss of Speech with Hemiplegia of the Left Side, Valv- ular Disease, Epileptiform Convulsions Affecting the Side Paralysed John Hughlings Jackson - -	927
Reports of Medical and Surgical Practice in the Hos- pitals of Great Britain - - - - -	930
The Hughlings Jackson Lecture on the Relations of Different Divisions of the Central Nervous Sys- tem to One Another and to Parts of the Body J Hughlings Jackson- - - - -	936
Index - - - - -	973

It is regretted that credit was not given to Dr. Wade Hampton Frost in our republication of Dr Peter Ludwig Panum's *Observations made during the epidemic of measles on the Faroe Islands in the year 1846* in the May, 1939 number of MEDICAL CLASSICS Dr Kenneth F Maxcy, Professor of Epidemiology at the School of Hygiene and Public Health of the Johns Hopkins University, as Chairman of the committee formed to complete Dr Frost's work, kindly gave us permission to reproduce the paper Dr Frost was responsible for uncovering and establishing this work of Panum's as a medical classic



JOHN HUGHLINGS JACKSON
[1834-1911]

MEDICAL CLASSICS

VOL. 3

June, 1939

NO. 10



John Hughlings Jackson

BIOGRAPHY

- 1834 Born April 4, of rugged midland stock, son of a Yorkshire farmer and a mother of Welsh descent Three brothers pioneered to New Zealand Attended the local school and then the York Medical School, meanwhile serving as an apprentice
- 1856 Age 22 Qualified as a physician Served for the next three years as assistant to Dr Laycock at the York Dispensary but determined to devote himself to philosophy rather than to medicine
- 1859 Age 25 Returned to London as protégé of Jonathan Hutchinson Following an attack of Bell's palsy and being encouraged by Brown-Séquard and Hutchinson, Jackson decided to specialize in neurology Became associated with the National Hospital in Queen Square, the Moorfield Eye and St Bartholomew's Hospitals
- 1865 Age 31. Married his cousin, Elizabeth Dade Jackson. Had no children Mrs Jackson died in 1876 of thrombosis of the cerebral arteries
- 1866 Age 32 Put forth his doctrine of cerebral localization
- 1870 Age 36 Described cortical (Jacksonian) epilepsy
- 1871 Age 37. Appointed Physician to the National Hospital in Queen Square
- 1886 Age 52 First President of the Neurological Society of London
- 1897 Age 63 Delivered the first Hughlings Jackson Lecture, established in his honor, before the Neurological Society of London

- 1911 Age 77 Died of pneumonia before being able to compile his papers for republication at the request of Drs William Osler, Weir Mitchell and James J Putnam
 Held the Harveian, Lumleian, Hunterian and other honorary lectureships
 Fellow of the Royal Society
 Held degrees from Bologna, Leeds and other universities
 His students and followers were Henry Head, Gordon Holmes, Edwin Bromwell, James Collier, Kinnier Wilson, James Taylor, Risien Russell and many others

EPONYMS

- EPILEPSY Characterized by localized spasm and is mainly limited to one side and often to one group of muscles, consciousness not being lost Called also Bravais—Jacksonian epilepsy
 SYNDROME Unilateral palsy of motor tenth, eleventh and twelfth nerves

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 Syphilitic affections of the nervous system Ibid, 82, 133, 502
 Cases of paraplegia from Queen Sq Hospital Ibid, 217
 Cases of injury to the head Ibid, 478
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seizures Ibid, 1. 110

Syphilis followed by unilateral convulsions four months after-
wards, temporary hemiplegia, paralysis of the sixth nerve
on the same side, recovery Ibid, 111

Unilateral epileptiform seizures, attended by temporary defect
of sight Ibid, 588

Epileptiform seizures, aura from thumb, attacks of coloured
vision Ibid, 589

Epileptiform seizures (unilateral) after an injury to the head
Ibid, 2 65

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to the back of the neck on the retinal circulation Ibid, 90

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system Ibid, 359

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use of iodide of potassium Ibid, 407

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Epileptic aphemia, with epileptic seizures on the right side Ibid, 167 only

Unilateral epileptiform seizures beginning by a disagreeable smell Ibid, 168

1865

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608-612

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Gaz, 1 703

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241, 341, 581

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1875

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1878

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1881

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Case illustrating the condition of the disc ten years after optic neuritis Abstr Brit M J, 1 645

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1884

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INTRODUCTION

Medicine received a rich benefaction from the studies of John Hughlings Jackson. Especially that aspect of the healing art which concerns the comprehension and diagnosis of diseases of the brain and nerves was enriched. To Jackson is awarded the first place among those who have contributed to neurology as a science.

In his early life, even after spending a considerable time in the study of medicine, Jackson determined to concentrate on philosophy. But due to the encouragement of Jonathan Hutchinson and Charles-Édouard Brown-Séquard, and following an attack of Bell's palsy, Jackson decided to apply his philosophical attitude to neurology. He became associated with Hutchinson at the National Hospital in Queen Square, at the Moorfield Eye and at St. Bartholomew's Hospitals and began to devote his time to a careful study of interesting clinical problems. After publishing about twenty short papers on neurologic subjects, Jackson wrote on the value of the ophthalmoscope in a study of affections of the nervous system. This paper served the double function of showing the importance of the instrument and of placing Jackson's name before the medical profession as a promising young practitioner. One of Jackson's early papers on the use of the ophthalmoscope, *Observations on defects of sight in brain disease*, is herein reprinted.

In 1864 Jackson made valuable studies on aphasia and his paper, *Loss of speech with hemiplegia of the left side*, is reproduced here.

As early as 1870 Jackson began his contributions to an understanding of unilateral convulsions which are now called in his honor, Jacksonian epilepsy. Jackson always insisted on the term cortical epilepsy but Charcot is credited with the popularization of the eponymic term. A description of patients suffering with this condition, under the care of Dr. Jackson, is here included. This short selection, *Clinical memoranda*, was not written by Jackson but was reported to the British Medical Journal by one of its correspondents.

Finally, as regards Jackson's contributions to neurology, his doctrine of "levels" in the nervous system must be given a prominent place. One of his most outstanding papers, a summation of his knowledge in this field, is the first Hughlings Jackson lecture (delivered by Jackson himself), *On the relations of different divisions of the central nervous system to one another and to parts of the body*. This valuable paper is here reproduced in its entirety.

As early as 1866, at the age of 32, Jackson had advanced our comprehension of cerebral localization. He showed that in the cerebral centers movements, rather than individual muscles, are delineated. He recognized that the centers are sensorimotor so that voluntary movement is "a glorified reflex." He described convulsions as "an experiment on the brain by disease." His perception of the storage of word memories led to an understanding of the present theory of sensory aphasia.

Jackson's greatest contribution to neurology was his application of the Herbert Spencer doctrine of evolution to the nervous system. Jackson recognized three evolutionary levels of the brain and spinal cord. The "lowest and most automatic" is the spinal cord and basal ganglia, the intermediate is the motor cortex, and "the highest and most voluntary" is the frontal cortex. In disease "dissolution" (the reverse of evolution) takes place. The highest levels suffer first and the patient passes from "a more voluntary to a more automatic state" as successively lower levels of the nervous system come into control.

Jackson himself summed up his teaching by writing "The same fundamental principles apply to all nervous diseases whatsoever, from such as paralysis of an external rectus up to insanity." This great thinker was able to combine minute clinical observations with broad philosophic principles, all colored by a gifted imagination. As an example of the former, Jackson described the details of cortical epilepsy and the syndrome of unilateral palsy of the motor tenth, eleventh and twelfth nerves. As an example of his use of philosophic principles, Jackson prophesied the constitution of the cerebral hemispheres and the form and function of the motor centers before subsequent experimenters confirmed his views by work on the higher mammals.

Jackson's writings are difficult to read. His detailed statements lead the reader down such a variety of bypaths that the main highway of thought may easily be lost. Jackson greatly feared being accused of overstatement and his writing in a laborious and explicit style was an attempt to ward off such an implication.

In appearance, Jackson was of medium height, with a bushy beard and moustache. He wore a buttoned-up frock coat with a stiff black tie and an open collar. He was of a serious mien, impressively dignified and inordinately shy. Sir Farquhar Buzzard wrote, "His inborn truthfulness, generosity and gentleness, together with his keen sense of humor, made him one of the most lovable men of his generation." Jackson has been called eccentric because he disliked being bored. His keen and penetrating mind was able to cover a wider range than most of his associates. His patience lasted only so long as his interest! Frequently he would not reach a medical meeting until the discussion was opened, he often left the theater at the end of the first act and seldom sat to the end of dinner. When traveling back to his native Yorkshire, he would break up the journey into several stages to avoid being bored. He was a voracious reader and was able to digest everything from the most learned volumes to the lightest penny thrillers. He would often tear up a book as he read it or would tear out pages which had more than a passing interest.

The four selections of Jackson's writings which are here reprinted are those listed by Garrison in his *History of Medicine* as the outstanding contributions of this great thinker.



Observations on Defects of Sight in Brain Disease

BY

J HUGHLINGS JACKSON, M D , M R C P

Assistant Physician to the London Hospital, Assistant Physician to the Hospital for the Epileptic and Paralysed, (late) Physician to the Metropolitan Free Hospital

(Published in the Royal London Ophthalmic Hospital Reports, 4 10-19, 1863)

I WISH to say, first of all, that in writing this paper, I write as a physician, and not as an ophthalmologist. I have studied ophthalmic medicine merely as a help to the study of diseases of the Nervous System. I look at the fundus of the eye, in cerebral cases, when there is even slight failure of sight, in order to ascertain the calibre of the retinal vessels, and the supply of blood to the optic discs, as evidenced by their greater or less coloration. For instance, after a fit of epilepsy, there is often severe headache attended by giddiness, singing in the ears, and other symptoms referrible to disorder of the circulation, and, generally, trifling (p 11) defect of sight. I trust that by a careful study of the circulation, both venous and arterial, in the eye, in cases like this, I may learn something as to the condition of the circulation of the brain itself in cerebral disease.

The above is put forward as some excuse for my venturing to address ophthalmologists on subjects on which they must necessarily have had more special experience than I have.

I intend chiefly to give a few particulars as to the causation of amaurosis in cases of tumours of the brain. The cases have al-

ready appeared in the Medical Times and Gazette for August 30, 1862. I then reported, from various hospitals, cases of diseases of the cerebellum, in many of which there was blindness

Blindness not uncommonly occurs in cases of tumour of the brain. Sometimes the optic nerves are compressed, and here the blindness is easily accounted for. Sometimes also one optic nerve only, on the cerebral side of the commissure, is affected, and then we get half-blindness of each eye. In many cases, however, it is somewhat difficult to account for the production of the amaurosis. In the Medical Times and Gazette for January 25, 1862, is recorded a case of echinococcus in one hemisphere of the brain. The patient, a girl, thirteen years of age, was in St. Thomas's Hospital, under the care of Dr. Risdon Bennett. In the report of the case, it is stated that she could neither walk nor stand, but that "when lying in bed, she could move the legs freely." There was no loss of sensation anywhere. There was complete blindness, and by the ophthalmoscope, the optic discs were seen to be white and atrophied. There was pain also, mostly at the vertex, but, at the first, the pain was at the occiput, where she had had a blow. Tumour of the brain was diagnosed, and "from the peculiar impairment of locomotive power, it was thought probable that the tumour was in the cerebellum." She had also epileptiform seizures. This case, during life, was certainly very like many cases of disease of the cerebellum, and yet at the autopsy, the cerebellum was quite healthy, and the optic tracts were, to the naked eye, quite unaltered.

(p. 12) The blindness in cases of tumour of the brain, not directly affecting the optic tracts, may be produced by the general pressure, or by reflex irritation, or because, in some way, the tumour interferes mechanically with the blood-vessels, so that parts at a distance do not receive their due supply of blood. It may be that the nutrition of the optic tract is interfered with because the nerves supplying its blood vessels arise or pass in the parts injured.

In the case of echinococcus, just related, and also in a case (under the care of Dr. Gull, in Guy's Hospital), of cancerous tumour of the cerebellum pressing on the corpora quadrigemina,

the optic discs were found, on ophthalmoscopic examination to be quite white (white atrophy), the rest of the fundus being healthy. This condition of the optic discs is what is found in nearly all cases of amaurosis in cerebral disease. In some, however, there appears to be not so much a defect of circulation, as an obstruction, the optic papillae being swollen, ill-defined, and blood being diffused near them, or in other parts of the fundus, as if the vessels had burst from overdistension. A well-marked case of this kind was shown to me by Mr Bader. He considered that there was probably a tumour of the brain, and that, by pressure, it mechanically obstructed the circulation.

In the ordinary white atrophy, the atrophy may be due to some eccentric irritation contracting the blood-vessels, and thus diminishing the supply of blood, so that wasting of the nerve follows, as wasting of the muscles does in infantile paralysis, which, also, is generally supposed to be due to some eccentric irritation contracting the vessels. The fact that sometimes, though in few cases, and then only at the beginning of the disease, the sight varies remarkably, tends to favour this idea, but at the same time it is well known that in *organic* disease of the brain, intermission of symptoms is not very uncommon. It may be that it is an instance of atrophy of the nerve following loss of its function, just as it atrophies when the eyeball is lost. In the case of (p 13) amaurosis above-mentioned, in which there was supposed to be mechanical obstruction to the vessels, the optic discs became after a time quite white, although their edges were ill-defined, and there were still remains of the apoplectic effusions.

That amaurosis does often occur in connexion with disease of the cerebellum, and also with disease of the spinal cord, has long been noticed. To explain how it occurs is not easy. It seems certain that the cerebellum is not the origin of the optic nerve fibres, as in Combette's case of congenital absence of the cerebellum (quoted by Mr Solly in his work on the Brain), all the senses were perfect. "The child could see, hear, and taste in a perfect manner."

Dr Brown-Séquard thinks that the defect of sight "is a result of an irritation of certain parts of the cerebellum acting upon the

nutrition of some parts of the nervous apparatus of vision " He says also — "It is not usually on account of a pressure upon the corpora quadrigemina that amaurosis exists in cases of disease of the cerebellum, as we find that loss of sight is sometimes observed in one eye only, and that is the eye on the side where exists the alteration in the cerebellum, while, if it were owing to a pressure on the tubercula quadrigemina, the loss of sight would be on the opposite side " In those cases of disease of the cerebellum to which I have alluded, in which there was defect of sight, both eyes were affected In the case of cancer of the cerebellum, no doubt there was, towards the end at all events, some interference with the corpora quadrigemina The tumour was large, and when the venae Galeni were pressed on, causing the effusion of serum and the "dropsy" of the brain, the corpora quadrigemina must also have been interfered with In other cases, as in the case related by Andral (p 18), and also in cases of amaurosis with paraplegia, pressure could have nothing to do with it

A remarkable feature, however, in one case was, that the sight varied remarkably Just as the man had had epilepsy and loss of function of the brain, so we might say he had temporary epilepsy of the retinae (or optic nerves) In epilepsy (p 14) the loss of consciousness is believed by Brown-Séquard to be co-etaneous with contraction of the blood-vessels of the brain It is attended by paleness of the face, and probably also, if I may use such expressions, paleness of the retinae and paleness of the brain It would be very desirable to examine the retina during a paroxysm of epilepsy We are not, however, often present when a patient has a fit, or we arrive, as generally happens, just too late, or, when in time, from the struggling of the patient, the examination is impracticable

In one case, however, a case of "epileptiform convulsions," I had the opportunity of examining the fundus of the eye, if not during a genuine fit, at least during a condition in which the consciousness was lost, and in which the pupils, ordinarily small, were dilated as if under the influence of atropine The optic discs were extremely pale Once, the vessels disappeared altogether for an appreciable time After a while, however, they

reappeared, and were found to vary with the respiration. When the patient *inspired* the vessels disappeared, returning again on expiration, like lines of red ink on white paper. This examination was too hurried, and the results too indefinite, to make it an observation of any great value. The case, too, was not one of genuine epilepsy, but one in which there was cancer of the sphenoid and secondary cancer of the glands in the neck. The fits occurred either as a result of obstructed circulation, or from pressure on the nerves of the neck. It is mentioned here merely to hint that it may be possible to study the cerebral circulation, by examining the vessels in the eye. I intend to examine the fundus of the eye in an epileptic guinea-pig, as a fit can be induced when we are ready for the examination.

In a few cases of epilepsy there is complete blindness for an appreciable time before the paroxysm—the patient is conscious, and yet in total darkness. And I have noticed that, in many cases of convulsions, in which one side of the body, only, is involved, there is temporary failure of sight before the full epileptic paroxysm. Cases in which there is (p. 15) failure of sight from temporary loss of accommodation are common enough, especially when the eyes are hypermetropic. In these cases the patients say that for a time they “cannot see”, but it is easily ascertainable that they can see, but that they see nothing distinctly—nothing in definition.

A person, whose eyes are hypermetropic, cannot see clearly, in the distance even, unless the ciliary muscle is *acting*. Failing power of this muscle will therefore cause confusion of sight. The patient cannot see well because the rays are not brought to a focus on the retina—the retina itself being sound. Hence defect of sight in hypermetropia is often significant of debility only. It is due, then, in many cases, to the debility so often attending the brain disease, and not directly to a fault of the nervous system. Whilst the patient is in health he can accommodate, in spite of the flatness of his eyeball, but when he gets out of health he is unable to do it. In many cases these distinctions are of consequence in diagnosis, as, of course, it makes a great difference as to the value of the symptom whether the defect of sight be

due to disorder of the diptric apparatus, or to the disease of the retina or optic nerve

The total blindness preceding the epileptic paroxysm is a different thing, and just as epilepsy is supposed to depend on contraction of the vessels of the brain, so the temporary amaurosis, in these cases, probably depends on contraction of the blood-vessels of the retinae—an epilepsy of the retinae

I believe that the following is an instance of epilepsy of the retinae. It seems clear that it was not merely failure of accommodation. One morning, Julia W., a middle-aged woman, came to me saying, that for five whole minutes she had been "blind." She was at the time seated peeling potatoes. The blindness came on suddenly and left suddenly. It was not total darkness, but "dark," which was the word she used herself in describing it. It was not from failure of accommodation. I asked her to look through a very strong convex glass. It was not like that, she said. It was not spots, nor specks, nor clouds, nor colours. When I saw her (p. 16) a minute afterwards, she could read well with each eye, and the fundus of each, as seen by the ophthalmoscope, was normal. She had headache across the forehead, which continued the next day. She said it felt "tight" across the forehead. She had no giddiness. She was regular, but subject to dyspepsia.

In cases in which loss of sight is followed by the epileptic paroxysm, may we not say that the contraction of the blood-vessels has begun in an outpost of the cerebral circulation (the retina being supplied by branches of the same vessels as the brain, these vessels being supplied by the same vaso-motor nerves), and that, on extension to the other branches of the carotid, the "brain's blindness," loss of consciousness supervenes? In but one of the cases of disease of the cerebellum, which I have reported, was there any note of temporary intermissions of sight. As a rule, the progress is gradual, and the loss of sight permanent.

To pursue the subject of the cause of reflex amaurosis in these cases, I may mention that it is not unusual, Dr Brown-Séquard tells me, for guinea-pigs rendered epileptic by section of one lateral half of the spinal cord, to become amaurotic. Whether

they are first subject to occasional and temporary loss of sight, it is, of course, impossible to tell. In a case reported in one of the Indian Journals, by Dr H V Carter, in which it was clear, by the symptoms, that a man had, from an accident, suffered an injury similar to that artificially made in the guinea-pigs, there was a transient epileptiform seizure and transient affection of the sight of one eye. Dr Carter writes —“One night the patient had a sudden attack of dizziness and confusion, and the head fell towards the left side, and the sight of the eye temporarily failed.” But transitory confusion of sight is due now and then to spasmodic affections of the external muscles of the eye. The patient, of course, does not know to what the confusion of sight is due, and when we do not see him during an attack, we can only judge by circumstantial evidence, more or less trustworthy. In a case of syphilitic epilepsy under my care, (p 17) the patient was convulsed on the right side of the body. He had convulsions of the face, arm, and leg, and confusion of sight *before* he became insensible. After one of these attacks, the side on which he had been convulsed, became paralysed. The external rectus, as well as the face, arm, and leg, was paralysed. To the convulsive action of this muscle was due, no doubt, the defect of sight preceding the epileptic paroxysms.

Dr Brown-Séquard has frequently drawn my attention to cases of paraplegia in which amaurosis has also existed, without any other symptoms to suggest disease within the cranium. These cases he refers to the same category as amaurosis from disease of the cerebellum. The blindness in both, he believes, is the result of eccentric irritation. Dr Wilks also has observed several such cases.

In cases of paraplegia of the lower limbs, there could, of course, be no pressure on the corpora quadrigemina or the optic tracts, and there does not appear to be greater difficulty in assuming a relation to exist betwixt the cerebellum or the spinal cord, and the retina, than betwixt the dorsal region of the spinal cord, and a certain tract on one side of the face in epilepsy artificially produced in the guinea-pig. That there is, in this latter case, a relation, is proved, not only by the fact that irritation of this

part excites the fits, but also by the fact that the nutrition of the same part suffers, as on this side lice are often found, and not on the other. To use a common expression, the tract on the face and a certain part of the spinal cord are correlated, and it is, I think, possible that there is a similar correlation between the cerebellum or (posterior column of?) the spinal cord and the retina.

But there is, I think, another explanation. It is well known that there may be disease of the brain, and yet no appreciable alteration to the eye unaided by the microscope. There may be enough disease in the tubercular quadrigemina to cause blindness, and yet little to be seen on ordinary examination. In the production of epilepsy in guinea-pigs, by (p. 18) section of one lateral half of the cord, the condition in which the fits can be excited by irritating certain parts of the face is not established for several weeks. It is supposed that the epilepsy results, not because there is an injury to the spinal cord, but because disease spreads upwards from the part injured to the medulla oblongata. Changes at a still greater distance even are induced. The nutrition of a certain tract of the face is altered. Possibly in the same way in diseases of the cerebellum, changes of nutrition may creep along (the *processus e cerebello ad testes?*) to the corpora quadrigemina and optic tract, and thus give rise to blindness.

If this be considered plausible we should seek supporting evidence from other cases of cerebral disease. In a very valuable communication, by Dr J. W. Ogle, in the Transactions of the Medico-Chirurgical Society, is recorded a case of hemiplegia caused by an aneurism pressing on the *crus cerebelli* of *the same side*. As it is known that injury of the *crus cerebelli* does not produce paralysis on the same side of the body, some other explanation must be sought. It is supposed by Dr Brown-Séquard that the paralysis is reflex, and is the result of irritation of the tumour, and as it cannot be due to the damage it inflicts locally, I venture to suggest that changes of nutrition may have passed along the *portio dura* and *portio mollis* (which were compressed and paralysed by the aneurism) to their origin in the opposite side, and that there they produced enough disease to cause pa-

ralysis on the then opposite side, *i e*, the side on which was the aneurism

Andral, in his work on Clinical Medicine, narrates cases of disease of the cerebellum in which there was amaurosis, and also cases in which there was not The following quotation is interesting

“With respect to the fourth case published by Dr Michelet in his Thesis, it is deserving of all our attention

“This was the case of a girl, eighteen years of age, who ten years before her death had had an attack of apoplexy, the result of which was *amaurosis without any other paralysis*, (p 19) and habitual headache An apoplectic cavity of an old standing was found in the right lobe of the cerebellum”

Speaking of another case in which there was hemiplegia as well as blindness, and in which the disease found was softening of one lobe of the cerebellum, Andral writes —“With respect to blindness, it seems at first that it has nothing to do with disease of the cerebellum, and yet this case is not the only one in which different affections of the cerebellum have been accompanied by a loss of vision May this fact be explained by the anatomical relations established between the cerebellum and the tubercula quadrigemina by means of the prolongations known by the name of *processus e cerebello ad testes*?”

THE END



Loss of Speech with Hemiplegia of the Left Side, Valvular Disease, Epileptiform Convulsions Affecting the Side Paralysed*

BY

JOHN HUGHLINGS JACKSON

(Published in The Medical Times and Gazette, 2 166, 1864)

THE following is the only case I have ever seen of hemiplegia of the left side with loss of speech. Indeed, when I saw him he could talk almost as well as ever, but it is perfectly clear that speech was lost after the attack. Mr Corner, under whose care the patient was at first, kindly sent him to me, and gave me much of the following information. I first saw the patient on March 19, 1864. He was a healthy-looking man 49 years of age. On February 5, 1863, at 11 a.m. he complained of severe headache and left work. After a walk he sat down and became speechless, and by the time he was got to bed, lost the use of the left arm and leg. He did not speak at all for six weeks, except to say "yes" and "no", and then asked what time it was. He was not insensible, but simply unable to talk. He put out his tongue when Mr Corner asked him. For two months there was considerable paralysis of the

* Copied from Selected Writings of John Hughlings Jackson Edited by James Taylor
London, Hodder and Stoughton, 1931, pp 3-4

arm and leg, and he never got well enough to go to work, on July 19 the same year he had a second attack, but this was not followed by any notable paralysis. It was a convulsive seizure and affected by one side, the side previously paralysed. It began in the left side of the tongue and next the arm and leg were convulsed, and he became insensible. He has had four attacks since, May 27, October 17, January 10, and again in July of this year. They all began in the same way, viz by an "aura" in the tongue on the left side, and the left side of the body was convulsed in each.

It may look like special pleading, but I must record the fact that in the first attack, the fact was, Mr Corner tells me, paralysed on the right side and the limbs on the left, so that probably the left side of the brain was affected as well as the right.

This patient had when I saw him, what appeared at first to be simply difficulty in articulation, but on referring to Mr Corner's account, and on again questioning the patient's wife, there is the clearest evidence that he was speechless for some time. On his first visit he could put out his tongue, and said he could eat and swallow well. Then the difficulty in talking was not a thickness, but rather a clumsiness, a kind of talking which is found in patients recovering from loss of the faculty of articulate language—the aphasia of Broca.

The case has great interest in several ways,—first as being an exceptional case, secondly as being complicated with unilateral epileptiform seizures, and thirdly as presenting a valvular lesion. There was a loud diastolic murmur heard best below the ensiform cartilage.

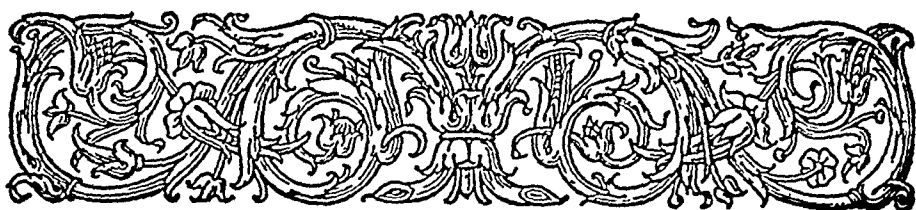
One chief point of interest is, that there were periodical convulsive seizures, not distinguishable from what would, by most medical men, be called epilepsy. These affected the left side, and were no doubt the result of softening from imperfect supply of blood to the brain in the region of the right middle cerebral artery. I have seen several cases of epilepsy of this kind with valvular disease. In each there was more or less hemiplegia, and, in those in which the right side was affected, more or less defect of speech. Cases of unilateral epileptiform convulsions coming

on suddenly in very healthy-looking young men suggest the inquiry whether some quasi-accidental cause, like embolus, be not more frequently the origin of epilepsy than is generally supposed. This is the more likely when it can be pointed out that the muscles first affected by spasm in those cases are the same as are paralysed in plugging of the middle cerebral artery, and again that the hemiplegia which sometimes follows the unilateral convulsion (epileptic hemiplegia) is also of the same kind as that which follows plugging. In the next case¹ the patient was not young, and had no valvular disease, yet the fact that she had temporary aphasia with the hemiplegia is enough to render it certain that she had disease in the range of the middle cerebral artery, even if the vessel itself was not primarily diseased.

Such cases seem to me to prove beyond doubt the truth of Dr Radcliffe's views, that the convulsions depend on enfeebled power on the nervous centers, or diminution of blood supply, rather than on increased irritability or on congestion. Now and then convulsions usher in hemiplegia from embolism. Here it is inconceivable that the condition of the motor tract, the corpus striatum, can be any other than one of anemia. It may be said that the medulla oblongata and not the corpus striatum is concerned in convulsion. Whatever the medulla oblongata may have to do in some links of the seizure, it is a fact that unilateral convulsions do follow from affections of the corpus striatum, as in the instance of embolism, and that they do follow disease on the surface of the hemisphere. The medulla oblongata may be diseased as well, but post-mortem examination shows that in unilateral convulsions the middle cerebral artery itself, or some part of the brain in its range, is diseased too.

THE END

¹ The case referred to is one described in the same paper, which it has not been thought necessary to include. (Original wording.)



Reports of Medical and Surgical Practice in the Hospitals of Great Britain

London Hospital
Clinical Memoranda of a Series of Interesting Cases of
Nerve-Disorder Now in Hospital

(UNDER THE CARE OF DR HUGHLINGS JACKSON)

*Case of Hemiparesis Case of Optic Neuritis Diagnosis of
Cerebral Disease in Two Cases, with Confirmatory Post Mortem
Examination Relation of Convulsion to Loss of Consciousness
Cerebral Disease produces characteristically other than Nervous
Symptoms Cause of Staggering in Paralysis of the Third Nerve
Ménière's Disease Optic Atrophy with Locomotor Ataxy Bilat-
eral Muscular Atrophy*

(Published in The British Medical Journal, 1 773-774, 1875)



WE HAD the opportunity recently, during a visit to the London Hospital, of observing a considerable number of cases of nervous disorder, which were brought under our notice by Dr Hughlings Jackson. The majority were cases under his own care, others were cases which had been placed partially under his care or observation by colleagues who were aware of his special interest in cases of the kind. The visit was one of very great interest, and it speaks volumes for the clinical value of this great hospital that so many cases of importance and interest in one department of medicine should be found

at one time in the wards. It must be added that the originality and studious thoughtfulness of the physician enabled him to throw new light upon and to develop valuable suggestions from the observation of cases of a kind which are often passed over as of little interest. We can speak of the cases only very briefly and from memoranda of the points which were particularly brought into prominence at the moment of our visit, and in the hurried clinical review of the cases made in passing through the wards on our visit. We shall take the cases nearly in the order in which we saw them.

The first was a man who had a peculiar unrhythmical and almost ceaseless twisting about of his right arm of some months' duration—a sort of localised "muscular insanity." The movements were not choreal, they were not punctuated, but glided into one another, the simple expression "twisting about" describes them best. The right leg was but slightly affected. Dr Hughlings Jackson uses the term *hemikinesis* for overmovements of one side of the body, as, for example, *hemichorea*, *hemispasm*, etc. He believes there is a discharging lesion of the cerebral hemisphere in these cases, but why in one the nervous discharge is in an almost continuous stream, in others in a punctuated sequence, and in others abrupt and occasional, he does not pretend to know. Very many kinds of treatment have been tried for this poor fellow, but the only thing which was followed by benefit was the subcutaneous injection of *woorara*. There could be no doubt of the benefit which followed this injection, for a time, too, the man's general health was better. Recently, the injection has been discontinued, because he has severe headache after it. It is noteworthy that, since its use, the sensation of the left arm has greatly diminished, it was slightly but decidedly less than that of the left arm before the injections were used, but now it is very much less. This clinically observed fact is important in reference to the erroneous conclusions of some that *woorara*, while paralyzing motion, increases sensation. The evidence afforded by this patient to the contrary is strongly marked.

Several cases of optic neuritis with supposed intracranial tumour were shown to us. Dr Hughlings Jackson insisted that

extreme neuritis very often existed with good sight. The ophthalmoscope ought to be used whenever a patient had severe headache. He said that he believed that, were the ophthalmoscope used by routine, there would be less blindness. He thinks it probable that there is always a preamaurotic stage of neuritis, and that, were large doses of the iodide of potassium given at that stage, the neuritis would often retrocede. As he invariably gives iodide of potassium in optic neuritis, he cannot make a confident statement. He showed us a patient whose neuritis had disappeared under iodide of potassium. He thought that optic neuritis is, although not certain, the best evidence of gross or coarse disease within the cranium. It was, however, of no value in localisation.

In one case, from the fact of convulsion of the right side, Dr Hughlings Jackson said there would be disease of the left cerebral hemisphere (a discharging lesion), next, from the fact that there was optic neuritis, the discharging lesion would be the result of irritation by coarse disease, and, in the case spoken of, that this coarse disease was probably an abscess, as there was disease of the bone in the orbit. He insists on this diagnosis of stages. This diagnosis was in essentials recapitulated with regard to a patient of Dr Hughlings Jackson whose body was to be examined *post mortem* by Dr Sutton that afternoon. The lad had had convulsions (some with and some without loss of consciousness), beginning in the left hand, he had double optic neuritis and intense headache (Dr Hughlings Jackson believed that the lad died of pain). So far, there was clear warrant for the diagnosis of a discharging lesion of the surface of the right cerebral hemisphere, and that that discharging lesion was the result of coarse disease. As to the particular nature of the coarse disease, there was a doubt. Dr Hughlings Jackson thought that, as there was organic ear-disease, there would be a scrofulous tumour. He has several times seen scrofulous tumour at autopsies of patients who had died with organic ear-disease, instead, so to speak, of cerebral abscess. In this lad there was found *post mortem* local roughening of the bone, subjacent adherence of membrane, and little tumours going from it into the convolutions. The area involved

was over about half a square inch behind the lower third of the fissure of Rolando on the right side. There was considerable local softening, and also great oedema beyond the parts actually softened. Dr. Sutton agreed with Dr. Hughlings Jackson in thinking it most probable that the local coarse disease was syphilitic. If so, it is the only autopsy on a case of congenital syphilitic disease of the nervous system Dr. Hughlings Jackson has seen which has revealed any coarse alteration. Such cases are valuable as bearing on Hitzig and Ferrier's experiments, but unfortunately the disease in this case was too extensive for any precise localisation.

We saw several other patients who were subjects of that kind of convulsions which the lad had whose case we have just mentioned. These are the cases which are illustrated by the experiments of Hitzig and Ferrier. Dr. Hughlings Jackson's plan is to ask the patient to describe his fits himself, this he can do in great part, as in the convulsions spoken of (commonly called epileptiform convulsions), a good deal occurs before the patient loses consciousness. One patient gave a very vivid account of what Dr. Hughlings Jackson calls the "march of the spasm." This patient's fit begins in his left index-finger and thumb, it then passes up the arm, and affects the face, and next passes down the leg. It is the rule that fits which begin in the hand should begin in the index-finger and thumb, when they begin in the foot, they usually begin in the great toe.

Speaking of these cases, and with reference to their difference from such cases as are commonly called epilepsy *par excellence*, Dr. Hughlings Jackson said he thought the abrupt division into cases with and cases without loss of consciousness was not even justifiable on grounds of convenience. The absolute separation was, he thought, a "survival" from a metaphysical stage of thought when consciousness was thought to be an entity. The real distinction even empirically broke down in practice. The distinction was, he insisted, into cases where consciousness was lost first of all, very early or late in the paroxysm. If the discharging lesions were in the very highest nervous processes, there would be loss of consciousness first of all, if the discharging

lesions were seated in a subordinate series of nervous processes, consciousness was lost late or not at all. Wherever the discharging lesions were seated, consciousness would be lost if the discharge were strong enough.

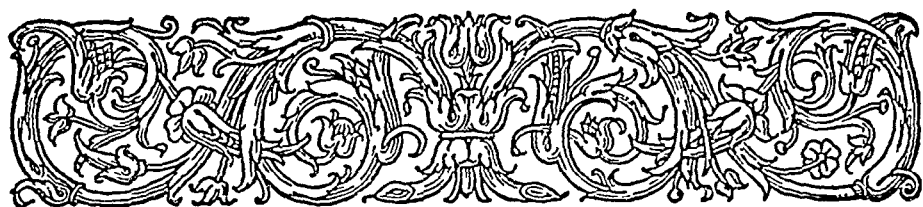
With regard to several cases of graver cerebral disease, Dr Hughlings Jackson insisted strongly on the fact that active mental symptoms (delirium) were not of much value in the diagnosis of primary cerebral disease, such as tumour or meningitis. Such symptoms, he said, occurred most often in non-nervous cases, pneumonia, erysipelas, etc. They may be called very general mental symptoms, for they occur under the most varied circumstances, prolonged fasting will produce them. Cerebral disease itself is but one of many conditions under which they arise. Then, on the other hand, the valuable symptoms of primary intracranial disease were, so to speak, non-nervous symptoms, vomiting, slow and irregular pulse, constipation, retracted belly, and, in acute cases, emaciations. He said it was a grave fault to take a nervous view of nervous diseases.

We saw a patient who had paralysis of the third nerve. Dr Hughlings Jackson showed by this case that double vision was not the cause of the giddiness in patients who have ocular palsies. Covering the good eye and raising the lid on the side paralysed, the patient was told to walk. He tried, but reeled on to a bed directly. The irregularity of gait results from the erroneous estimation of the position of objects by the faultily moving eyeball, or rather, by the nervous centre for the movements of it.

We saw also a patient who had had attacks of Ménière's disease. For a long time after a paroxysm, when his eyes were closed, he reeled in his gait. Dr Hughlings Jackson is a firm believer in the association of ear-disease and vertigo, reeling, and vomiting. Sometimes the reeling lasts for months after an attack. He has three cases of Ménière's disease under his care now, in one of them, as there is a renal disease—a common condition for retinal and cerebral haemorrhage—he thinks there is haemorrhage into the labyrinth. There are, however, no haemorrhages in the retina. In cases where the ear-disease is irremediable, Dr Hughlings Jackson treats the effects, he gives digitalis, bromides, etc.

We saw a patient who had simple atrophy of the optic nerves along with locomotor ataxy. Simple atrophy of the optic nerves is an aid to diagnosis in doubtful cases of ataxy. It is a "masculine" affection, rarely seen in women, in whom also locomotor ataxy is rare. Atrophy after neuritis is common enough in women. The case spoken of was in other respects rare, the ataxy was chiefly in the arms. Atrophy of the optic nerves is rarely seen in locomotor ataxy.

There was a patient who, besides being absolutely deaf, had bilateral muscular atrophy. Progressive muscular atrophy, as a rule, not only begins unilaterally, but it affects, first and most, those muscles whose chief use is unilateral, it begins in the hand. In this class of cases, Dr. Hughlings Jackson showed us certain muscles of locomotion are bilaterally affected, which are often used bilaterally or alternately, there was complete palsy of both *serrati magni*, so that the scapulae stood out like wings of the *erectores spinae*, so that the man's shoulders were held further back than the buttock, and of other muscles. Dr. Hughlings Jackson has seen these palsies with palsies of cranial nerves, of vocal cords, deafness absolute, and with palsy of both facial nerves without deafness. He has had no necropsy. He has never seen a case in an active stage. Several he has had under care for many months, the symptoms remaining unchanged.



The Hughlings Jackson Lecture on the Relations of Different Divisions of the Central Nervous System to One Another and to Parts of the Body

Delivered before the Neurological Society, Dec 8th, 1897

BY

J HUGHLINGS JACKSON, M D ST AND, F R S

*Consulting Physician to the London Hospital and Physician to the National Hospital for
the Paralysed and Epileptic*

(Published in The Lancet, 1 79-87, 1898)



AFTER expressing his inability properly to thank the Society for asking him to deliver this the first Hughlings Jackson Lecture, Dr Hughlings Jackson said —

It is an excellent thing, for clinical purposes, to study nervous maladies by type. This, it seems to me, is the plan adopted in books on the practice of medicine, an account is, for example, given of the malady, tabes, its complications are mentioned and abortive forms are described, a description of the malady, as, in different cases, it approaches or reaches or deviates from a type is given. There are other ways of studying nervous maladies, for example, as they are Dissolutions, that is, as they are reversals of Evolution of this or that part of the nervous system, that is, as they are departures from

normal states In these investigations we do not abandon clinical work, we must study nervous maladies by type first of all One advantage of considering nervous maladies as dissolutions is, that in doing so we are obliged in each case to deal with the diseased part as a flaw in the whole nervous system, we thus have to take into account the undamaged remainder and the evolution still going on in it Apart from these applications of the doctrines of evolution and dissolution I would urge, as I have often done, that a great part of symptomatologies in nervous maladies with negative lesions is the outcome of activities of undamaged, healthy, structures—that that part is a problem, not in pathology, but in physiology, I have illustrated this in several ways in *The Lancet* of Dec 12th, 1896 We can attempt a study of some very different nervous maladies by comparing and contrasting them as they are owing to disease of Evolutionary Levels of different grades of the central nervous system For example, I make the hypothesis that progressive muscular atrophy, paralysis agitans and general paralysis are owing to disease of, but not limited to, motor centres of, respectively, the lowest, middle and highest levels of the Cerebral Sub-system With references to what I said a moment ago I here remark that whilst I suppose that the negative lesion (which is produced by a pathological process) of the middle motor centres in paralysis agitans, answers to the paralysis I suppose that the tremor and rigidity are owing to over-action, hyper-physiological state, of perfectly healthy centres, anterior horns and perhaps of the cerebellum also

There are certain Complementary Inverses (cerebral and cerebellar) worthy of consideration, these will be considered later in a little detail One profitable way of studying nervous maladies is by comparing and contrasting the effects of a destruction-lesion with those of a discharge-lesion of the same centre or region, for example, the commonest variety of epileptiform seizures (the kind of epilepsy described by Bravais, 1827) is to a great extent the mobile counterpart of the commonest variety of hemiplegia We have, however, in making such comparisons and contrasts to bear well in mind that there are greater positive

effects from a discharge-lesion (because discharges spread) than there are negative effects from a destruction-lesion, hence the qualifying words "to a great extent" We can compare and contrast the after-effects (temporary functionlessness of nervous elements) of sudden and excessive discharges (those of discharge-lesions) with the effects of destruction-lesions There is, I suggest, a variety of so-called idiopathic epilepsy, in which there is a discharge-lesion of, or of some elements of the auditory center of Ferrier, *destruction* of which centre in the left half of the brain would produce the particular Imperception called Word-deafness (first described by Dr Charlton Bastian), the discharge, however, only *begins* in this centre (primary discharge) and spreads from it to associated centres (secondary discharges) *After* the attack there is, I presume, exhaustion, temporary, of more or fewer of the elements discharged in the paroxysm, then there is, not only Word-deafness, but also another particular Imperception, Word-blindness, in a case I have recorded¹ there was inability to speak too, all the symptoms were temporary So presumably the effects of discharge beginning in the centre alluded to and certainly the after-effects of that discharge when it has been widespread, are greater than the effects of destruction of the centre would be This leads me to a further remark on methods of study I do not think we analyse the symptomatologies of epileptic fits with sufficient thoroughness, as Fere has well said, there are as many epilepsies as there are epileptics In a minor attack of epilepsy there may be smacking movements of the tongue and lips, the "epigastric aura," the so-called intellectual aura, which I prefer to call "dreamy state," defect of consciousness passing into unconsciousness, and slight convulsion, and after the fit there may be loss of consciousness with elaborate actions I believe that in some cases, as in so-called procursive epilepsy, the two stages—that of the fit proper and the post-paroxysmal state—are not always distinguished No analysis

¹ Cerebral Paroxysms (epileptic attacks) with an Auditory Warning, in slight seizures the special Imperception called "Word-Deafness" (Wernicke) and "Word-Blindness" (Kusssmaul), Inability to Speak, Spectral Words (auditory and visual) *The Lancet*, Aug 4th, 1894

of the symptomatologies of such paroxysms as the minor attack mentioned is on a thorough basis which does not distinguish the psychical from the physical, which does not take heed of the vast differences in complexity, &c, of crude sensations, such as the "epigastric aura," and such elaborate psychical states as the "dreamy state" (for example, the exceedingly elaborate state, a "feeling of being somewhere else"), which does not distinguish real movements, for example, smacking of the lips as if tasting, from convulsion of small parts of the body, turning up of the eyes, for example. There is another kind of study. We have to try to show how it is that two such sets of phenomena as universal convulsion with cessation of consciousness (in a severe fit of so-called idiopathic epilepsy) and insanity with in some cases profuse and elaborate mentation—how both these exceedingly different symptomatologies result from disease of, or disease beginning in, the "mental centres", it is not enough to study each of the maladies in isolation, all the more because often enough we find the two occurring in one patient, there may be a paroxysm of universal convulsion with cessation of consciousness and then the insanity loss of consciousness and mania or that greater degree of insanity, post-epileptic coma. This leads me to say that we do not always take into account in our studies of post-epileptic states all the degrees of insanity which are found after different degrees of epileptic fits. Thus, post-epileptic coma is not thought of, as it should be, as a post-epileptic insanity, as a greater degree of insanity, one signifying a greater depth of Dissolution of the highest level, than post-epileptic mania, post-epileptic coma is acute temporary dementia, is so, I mean, so far as the highest level is concerned.

For the kinds of work indicated some scheme of the whole nervous system is necessary. A morphological seriation, such as spinal cord and encephalon, or such as cord, medulla, pons, cerebellum and cerebral hemispheres, will not serve us. We must have a scheme according to degrees of directness and complexity with which nervous centres, or as I shall say, Levels, represent impressions and movements of parts of the body, this is an anatomical, not merely a morphological, scheme.

I divide the central nervous system into two Sub-systems—Cerebral and Cerebellar. The two have what I call the Lowest Level in common, or in other words this level is the lowest of the cerebral sub-system and also of the cerebellar sub-system.

The Lowest Level extends, it is suggested, from the tuber cinereum to the conus medullaris, it is made up of an homologous series of sensory and motor centres lying in the cord, medulla, pons, and aqueduct, with the fibres inter-connecting them. These centres represent the body in detail, motorily, (p. 80) from ocular muscles (ciliary muscle?) to muscles of the perineum (sphincter ani?). There are also, besides higher Levels, Superior centres of the lowest level itself, for example, there is the respiratory, medulla, centre which, to speak of motor elements alone, represents the muscles of the respiratory apparatus indirectly—represents movements of them by intermediation of the laryngeal, phrenic and costal motor centres, centres of the homologous series of the level. There are, I suppose, other Superior centres with their subordinate centres for intestinal action, defecation, micturition, the sexual act, parturition, &c. The homologous series of centres with the superior centres and the fibres inter-connecting them are what will be called Intrinsic elements of the level.

The Rolandic region of the cortex cerebri and the prefrontal lobe (region in front of the pre-central sulcus) are the motor provinces of, respectively, the middle and highest levels of the cerebral sub-system. Now as to the sensory provinces of these higher levels, I have formerly spoken of the occipital lobes as the highest sensory centres of the cerebral sub-system, but I am now unable to say with confidence what parts of the cerebral hemispheres are the sensory provinces of the middle and highest levels of the cerebral sub-system. In what follows it is to be understood that the unit of constitution of the whole nervous system is sensori-motor, and also that the so-called motor provinces, of the middle and highest levels at least, are supposed to be only *chiefly motor* and their sensory provinces only *chiefly sensory*. I have not attempted any division of the cerebellum into levels.

It is well to give synonyms, popular and scientific, of what I call the highest level of the Cerebral sub-system, the acme of nervous evolution, so-called “organ of mind,” “mental centres,”

"anatomical sub-strata of consciousness," "physical basis of mind" As to the nature of the relation of consciousness or, synonymously, mentation, to activities of the sensori-motor nervous arrangements of the highest level, I have no hypothesis, I assume concomitance of psychical states with nervous states of at least the highest layers of this level It is right before going further to say that Dr Ferrier,² for whose opinions on all neurological questions I have a most profound respect, differs from me with regard to what I call the highest level I admit that this part of my scheme is very hypothetical, and I do not suppose that there is so decided an anatomico-physiological difference between the motor provinces of the highest and middle levels as there is between those of the middle and lowest levels I admit, too, that the scheme of three levels is incomplete, nothing has been said of the sympathetic system, nor of what may be called the olfactory and optic nervous systems, the retina is, developmentally, part of the brain itself, and possibly some elements or some layer of, the retina may be the lowest centre of the optic nervous system

With regard to the Lowest Level, we have to consider, besides its Intrinsic elements already enumerated, its Extrinsic elements The extrinsic elements of this level are of two kinds (1) fibres extrinsic upwards—for instance, those of the pyramidal tract, and (2) fibres extrinsic downwards—for instance, those of the posterior columns The best illustration of extrinsic elements of the lowest level is given by a consideration of what Sir William Gowers calls ataxic paraplegia In this malady there is (1) disease of fibres of the lateral columns, those of these fibres which are of the pyramidal tract are fibres extrinsic upwards, there is also (2) disease of fibres of the posterior columns, fibres extrinsic downwards Although both sets of fibres are solidly part of the morphological mass, the cord, neither is part of the anatomico-physiological community I call lowest level, they are (1) fibres connecting centres of that level with centres of the middle level, and (2) fibres connecting centres of the lowest level with parts of the body

² The Functions of the Brain, second edition, p 460

The next question is as to fibres extrinsic upwards connecting centres of the lowest level with the cerebellum. Connexion by sensory fibres is admitted, fibres of the "direct cerebellar tract" are fibres extrinsic upwards to the cerebellum. Connexion by motor fibres is not admitted. Marchi has described fibres "descending" from the cerebellum into the spinal cord, but these fibres have not been found by Ferrier, Aldren Turner and Risien Russell, recently M. Thomas has expressed his agreement with Marchi.

Sir William Gowers has put forward the hypothesis that, there being no known direct connexions between the cerebellum and motor centres of the cord, the cerebellum exerts a restraining influence on motor centres of the cortex cerebri and that the cerebellum coordinates movements by intermediation of these centres. There is an important experiment by Risien Russell in striking accord with Gowers' opinion that the cortex is restrained by the cerebellum, Russell found that after removal of one lateral lobe of the cerebellum, there was increased excitability of the motor cortex of the opposite cerebral hemisphere.

It is convenient to mention here certain of the most interesting and very wide-bearing researches by Dr. Sherrington on what he calls Reciprocal Innervation, his latest paper on this subject, written in conjunction with Dr. Hering, of Prague, was read before the Royal Society, Nov. 18th, 1897. A monkey (*Macacus cynocephalus*) is placed under ether or a mixture of ether and chloroform and during a stage when there is a maintained flexion of the elbow, to limit attention to that part, the cortical focus presiding over extension of the elbow is faradically excited, the result of this excitation is an immediate relaxation of the biceps, with active contraction of the triceps, on discontinuing the excitation of the cortex the forearm usually immediately, or almost immediately, returns to its previous position of flexion which is again, as before, steadily maintained. Sometimes during the narcosis the arm assumes a posture of extension, tonic and maintained, if in these circumstances "the appropriate focus in the cortex, previously ascertained, for flexion of forearm or upper arm," is excited the triceps is found to relax and the biceps

at the same time enters into active contraction. The authors write³ "It should be remarked that under use of currents of moderate intensity we find that not from one and the same spot in the cortex can relaxation and contraction of given muscles be evoked at different times, but that the two effects are to be found at different, sometimes widely separate, points of the cortex, and are there found regularly."

There are some very important and valuable researches by Lowenthal⁴ of great interest in many ways, showing that the cerebellum has motor connexions with the spinal cord, if not direct connexions. Lowenthal observed that when the cerebrum of a dog was removed, excitation of a certain part of the cerebellum, acting when the spinal cord was in tonus, produced relaxation of the triceps and contraction of the biceps of the fore limb. Although Lowenthal has shown that excitation of the cerebellum produces motor effects without acting on the cortex cerebri (the cerebrum having been removed in the animals he operated on), it may be that in the coordination of movements of entire animals the cortex cerebri also is acted on by the cerebellum according to the hypothesis Gowers has stated—that the cerebellum in coordinating movements acts in two ways on the cord, directly and round by the cortex cerebri.

I have now to re-state an old hypothesis on dynamical relations of the two Sub-systems to one another by intermediation of motor centres of the lowest level.⁵ Speaking very roughly and neglecting some parts of the body, the cerebrum represents movements of skeletal muscles in the order arm, leg, trunk, preponderatingly flexor-wise, the cerebellum represents movements of these same muscles in the order trunk, leg, arm, preponderatingly extensor-wise. It is also supposed that impulses from motor centres of the higher levels of each sub-system continuously act upon the motor centres of the lowest level which are common to both sub-systems, that the impulses from each set of higher levels antagonise, or inhibit, one another, that they do so in different degrees

³ Proceedings of the Royal Society, vol. LXII, No. 381, p. 185

⁴ Lowenthal and Horsley, *ibid.*, vol. LXI, No. 369, p. 20

⁵ See Medical Examiner, April 5th, 1877, and March 28th, 1878

upon different lowest motor centres, and that the degree with which the cerebral or cerebellar influence preponderates is the same as in the order of the degree of the different representation by the cerebrum and cerebellum of the muscles of the body. So to say, the cerebrum "has most of its own way" on the arm and most nearly fully antagonises cerebellar "influx" upon lowest motor centres for that limb, and in the same manner of speaking, the cerebellum "has most of its own way" on the trunk and most nearly fully antagonises cerebral influx upon lowest motor centres for that part. In accordance with this hypothesis, the rigidity in the common cerebral paralysis, hemiplegia, results because cerebral influence being taken off the lowest motor centres in the order in which the cerebrum represents movements, viz, arm, leg, trunk, cerebellar influence upon those lowest motor centres is no longer antagonised, there is then unimpeded, and therefore greater, (p 81) cerebellar "influx" into the lowest motor centres which the cerebrum *has abandoned*

It was asserted against this hypothesis that, upon complete transverse lesion of the spinal cord above the lumbar enlargement—both cerebral and cerebellar influence being cut off from centres below the lesion—the legs are rigid and the knee-jerks exaggerated. But Dr Charlton Bastian⁶ has brought forward cases showing that upon *total* transverse lesion of the spinal cord above the lumbar enlargement the legs are flaccid and the knee-jerks absent. His conclusions are, I think, adopted by most neurologists in this country, they have been confirmed by Bowlby, Thorburn and Bruns (of Hanover)

I pointed out some years ago⁷ that in some cases of total transverse lesion of the dorsal cord the knee-jerks, at first lost, have returned, in one case after being absent thirty-eight days, in another two years, although in neither case was there any return of motion or sensation in the legs. I have published⁸ a dorsal case in which there ensued a loss of faradaic irritability in some muscles of the legs and diminished irritability in others, this

⁶ Transactions of the Royal Medical and Chirurgical Society, 1890.

⁷ *The Lancet*, March 5th, 1892

⁸ *The Lancet*, Dec 12th, 1896

case may seem to countenance the opinion of those who believe that the loss of the knee-jerks in cases of total transverse lesion of the cord above the lumbar enlargement is owing to morbid changes in lumbar centres secondary to the transverse lesion, but in the case remarked on, the knee-jerks returned showing that the lumbar centres concerned with these jerks were intact, at any rate in some degree, the returned jerks were not exaggerated. I have several times stated objections which may be brought against the theory of cerebral and cerebellar influx, some of which I admit to be serious. I am able to say that Dr Bastian is in essential agreement with me as to cerebellar influx. I have, however, to mention that this hypothesis is not accepted by Bruns and Risien Russell,⁹ and probably not by most neurologists.

There is another way of considering relations of the cerebral and cerebellar sub-systems to one another on the hypothesis of their having the lowest level in common, we can compare and contrast certain cerebral and certain cerebellar symptomatologies with one another as Complementary Inverses (Corresponding Opposites). Thus in cases of tumour of the middle lobe of the cerebellum there is paralysis in the order of loss of movements of the trunk, legs, arms, this is roughly the complementary inverse of Cerebral paralysis (hemiplegia) in which the loss of movements is in the opposite order, arm, leg, trunk. Another Complementary Inverse, an imperfect one, is cerebellar paralysis and rigidity (I used to call this the Cerebellar Attitude) with cerebral paralysis (hemiplegia) and rigidity. According to the hypothesis advanced the former is paralysis in cerebellar order with "influx" from the cerebrum, the latter is paralysis in cerebral order with "influx" from the cerebellum.

A more perfect Complementary Inverse is of a case of extensive cerebellar paralysis and rigidity, with the double hemiplegia and rigidity which constitute the symptomatology of an advanced case of paralysis agitans, in the former the general attitude is opisthotonic, in the latter slightly emprosthotonic. There is another Complementary Inverse, in some cases of tumour of the middle lobe of the cerebellum there are tetanus-like seizures the

⁹ Philosophical Transactions of the Royal Society, 1884

complementary inverse of cerebral convulsions These tetanus-like fits being things paroxysmal, are of different nature from the persisting cerebellar paralysis with rigidity, as certainly as epileptiform seizures (epilepsy described by Bravais, 1827) are of different nature from cerebral paralysis (hemiplegia) with rigidity I urge this because the tetanus-like seizures (cerebellar convulsions) look like mere temporary exaggerations of the "cerebellar attitude" in cases with which they may occur, they are really very different things¹⁰ The Tetanus-like seizures depend, I suppose, on *occasional* excessive *discharges* beginning in some part of the cerebellum and producing super-positive effects in cerebellar order, trunk, legs, arms, such a paroxysm (cerebellar convulsions) is, speaking generally, the Complementary Inverse of an Epileptiform or epileptic seizure (a cerebral convulsion) from *occasional* excessive *discharges* beginning in some part of the cerebral cortex and producing super-positive effects in cerebral order, arm, leg, trunk, whereas, as aforesaid, in the persisting cerebellar paralysis with rigidity, there are negative effects in cerebellar order, trunk, legs, arm with *continuous cerebral* influx invading (centre, for) the parts paralysed I think the younger generation of Neurologists is not well acquainted with these cerebellar symptomatologies, some years ago Dr Stephen Mackenzie and I investigated several such cases I published a case of tumour of the middle lobe of the cerebellum with tetanus-like seizures¹¹ I used to think that spasmodic drawing back of the neck was a cerebellar, and not a cerebral, symptom Dr Buzzard has, however, published¹² a case of retraction of the head from tumour of one temporo-sphenoidal lobe Tetanus-like seizures occur in cases of glioma of the pons, I have pointed out that when there is cerebellar tumour such seizures (and I have only seen them with tumour) may be said to be owing to pressure on the adjacent corpora quadrigemina or subjacent medulla Those who adopt the pressure hypothesis have, in some cases of tumour of the

¹⁰ I have compared and contrasted the symptomatology of tetanus, ordinary surgical tetanus, with that of cerebral convulsion (Medical Press and Circular, June 9th, 1880)

¹¹ Brit Med Jour, Nov 4th, 1871

¹² Brain, vol 1v

middle lobe of the cerebellum, not one thing, but three things to account for, (1) cerebellar paralysis, (2) cerebellar paralysis with rigidity (cerebellar attitude), and (3) tetanus-like seizures. Is it likely that pressure would produce these three very different symptoms?

I speak next of an important principle of Bernard's, one applied by Anstie and Thompson Dickson to nervous maladies. It may be said that every part of the body has some degree of autonomy, and is yet in subordination to, is directed and controlled by, the nervous system or some part of it, the heart has a great degree of autonomy, a skeletal muscle little. After a motor nerve to a skeletal muscle is cut the muscle is not quiescent, there are fibrillar contractions, over-action from loss of control. To go to the other extreme of the nervous system, in cases of post-epileptic mania there is over-action of lower "layers" of the highest level ("mental centres") from loss of function of the highest "layer" or "layers" of that level, "taking off" of the higher layer, Dissolution, is a "letting go" of the lower layers which are then not only no longer directed but also no longer controlled, hence their activities (evolution going on) are at a greater rate than normal. I have suggested that in cases of insanity the rate of "taking off" is a very important factor, that the more rapidly dissolution is effected the greater is the activity of the lower range of Evolution remaining. The senile dement, dissolution very slowly effected, is quiet, the post-epileptic maniac, dissolution very rapidly effected, is the most furious of all maniacs. I have called "the rate with which Dissolution is effected" the third Factor in Insanities.¹³

Another very important thing with regard to my subject is Regulation of the digestive, circulatory and respiratory systems. There are, I have put it, three factors in Regulation. Thus with regard to the respiratory system, there is (1) Nervous regulation, the respiratory, medulla, centre is probably to some extent automatic, goes on by itself, it is also influenced by impulses ascending the vagi and by the higher levels (by "upper brain tracts"), (2) There is Mechanical regulation, the elasticity of the lungs and

¹³ Medical Press and Circular, Jan 13th, 1894

of the costal cartilages (expiration in quiet breathing being chiefly recoil), (3) There is what, for want of a better term, I will call regulation by Chemical stimuli, and in this case by venous blood, a natural stimulus of the respiratory centres (deficiency of oxygen) With regard to chemical stimuli, a very bad term, I admit, I have suggested that effete nitrogenous products act as natural stimuli to the vaso-constrictor, medulla, centre before they are eliminated by the kidney I have heard more than one medical man say that he felt better when a little gouty, better for mental exertion I suppose was meant The late Milner Fothergill¹⁴ said that "gout poison stimulates the intellect in the earlier stages of Bright's disease" I suppose that, owing to an excess of nitrogenous effetes, to an excess of its natural stimulant—the vaso-constrictor centre is highly stimulated in certain cases of Bright's malady, whereby general arterial tension is raised And since the cerebral arteries have comparatively little muscular tissue (some physiologists consider it not demonstrated that these arteries have vaso-constrictor nerves) the result will be that the brain gets more blood and thus in the early stages of the (p 82) malady it will be, at least in some ways, in better working order This state of things is, however, more pleasant than safe, and yet a salutary reduction of high arterial tension by dieting and by medicines is not always appreciated by our patients Schafer's researches on the suprarenal capsules, his showing that an extract of the medulla of these bodies raises arterial tension, is very important in this connection, arterial tension is raised by this extract, by its action on the muscular coats of the arteries (It is possible that effete nitrogenous products act similarly and not on the vasoconstrictor centre as I suggested) It will be seen that in speaking of Regulation and in particular of the factor chemical stimulus I have not been leaving the topic of this lecture, for example, stimulation of the vaso-constrictor centre of the lowest level will influence the higher levels of the cerebral sub-system, there is a roundabout relation between the lowest level and these higher levels, from

¹⁴ Journal of Mental Science, October, 1874, p 401

high arterial tension the brain will get more blood, from low tension less blood

I have spoken of the possible "stimulation of the intellect," to use Fothergill's expression, in some cases of raised arterial tension. There is, I think, another way in which "the intellect" is affected in certain abnormal states. It has been suggested by Greg¹⁵ (whom Fothergill quotes¹⁶) that bodily pain and disease "may directly contribute to the loftiest efforts of the intellect. They sometimes positively enhance its powers." Here is a very important question, too large a one to be dealt with fully here. I think that in some states of ill-health, sea-sickness, slight febrile ailments and in some states scarcely to be called abnormal, as in that of general bodily fatigue and that after taking a small quantity of alcohol (only as much alcohol, let us suppose, as, according to the Scotch witness, makes a man not worse, but "better for" liquor), there is increased mental activity *of a sort*, a great flow of ideas. In this mentation there is, I think, mainly an increase of the first "half" of thought, tracing resemblances, whilst the noting of differences, second "half" of thought is diminished, or, to use popular language, there is greater "brilliancy" with less "judgment." If so, it is not a desirable condition even from a non-medical point of view. From lowered arterial tension there may be, I think, much mental activity of the kind mentioned—a kind not likely to be that Fothergill meant when he spoke of "stimulation of the intellect" by "gout poison," if there was a rise of arterial tension in that condition. I submit that from lowered arterial tension, the brain receiving less blood, there is some degree, even if a very trivial one, of dissolution of the highest level, only the very highest nervous arrangements of the highest "layer" of this level are, I shall suppose, put out of function or are lowered in function, thus the lower arrangements, those next to the highest, of that layer are in increased activity from loss of control by the now temporarily absent (functionally absent) highest nervous arrangements.

The Scale of Fits—There are, I think, Lowest Level Fits,

¹⁵ Enigmas of Life

¹⁶ Op cit

Middle Level Fits (the epilepsy described by Bravais, 1824), and Highest Level Fits (so-called idiopathic epilepsy)¹⁷ I now consider only lowest level (ponto-bulbar) fits and only those of them which I think are respiratory. Other lowest level fits are producible by certain poisons, by camphor and absinthe, for example, and I think by some home-made poisons as in uraemic fits, there are, I think, still other lowest level fits analogous to fits producible in guinea-pigs by Brown-Sequard's method.

It is certain that there are respiratory fits in some lower vertebrates, or rather, such fits are easily producible in them by experiment. Kussmaul-Tenner fits in rabbits are of this kind, whether these fits are produced by ligaturing the great arteries of the neck, by rapid bleeding or by sudden obstruction of the trachea, they depend on absence of oxygen, in each there is an excessive discharge beginning in the respiratory, medulla, centre I have suggested¹⁸ that laryngismus stridulus in man (the infant human being)¹⁹ and convulsions in some cases of whooping-cough in young children are fits beginning by excessive discharge of the respiratory centre.

I must here point out that Horsley and Semon think that attacks of laryngismus stridulus are of cortical origin, they have shown that discharge of the laryngeal centres of one half of the brain will close the glottis, they adduce the existence of carpo-pedal contractions in laryngismus stridulus as evidence favouring their view of its cortical origin. With great respect for the opinions of these men who have done such highly original work on laryngeal representation by the central nervous system, I think carpo-pedal contractions (very different phenomena from paroxysms or convulsion) are not owing to cerebral discharges, but to suspension of cerebral (middle level) influence on anterior horns (some lowest motor centres) for the hands and feet—the

¹⁷ I do not say that all fits *called* epileptic (so-called idiopathic) are owing to discharge lesions of parts of the highest level. There are seizures *called* epileptic depending on discharges beginning in parts of the temporo-sphenoidal lobe, convulsions of these lobes may not be parts of the highest level.

¹⁸ *Brain*, April, 1886

¹⁹ For an able criticism of my opinions on this matter, see a paper by Dr Gay, *Brain*, January, 1890

function of the cortical cells being, I mean when these contractions occur in cases of laryngismus, lost from supervenosity, the cells of the anterior horns for the hands and feet over-act from loss of cerebral control and perhaps also from greater cerebellar "influx"

I have only spoken of respiratory fits in very young children. It is current doctrine that very young children are prone to fits and I have now to consider how it is that they are prone or to those I call lowest level fits. The breathing of the infant is diaphragmatic, the pyramidal tract is not fully developed in the infant²⁰, according to Soltmann inhibitory nervous arrangements are but little developed in very young animals and thus little in the human infant, it is well known that very young children tolerate large doses of belladonna (a paralyser of the endings of inhibitory vagus fibres in the heart). In the infant up to one year the respirations are 44, I suppose that this great rate signifies little cerebral inhibition of the respiratory, medulla, centre, this inhibition gradually develops in the infant as it grows older when breathing becomes less frequent. A healthy infant's breathing may be irregular with short pauses (Henoch) a slight resemblance to Cheyne-Stokes' respiration. Dr Goodhart²¹ remarking on Cheyne-Stokes' respiration writes "The respiratory centre goes back to its less educated form, and reproduces, in an exaggerated way, the rhythmical character of the respiration that is more or less natural in infancy"

I submit then that we may conclude that, in comparison with the adult, the lowest level centres, especially the Superior Centres, are in infancy little governed (positive-motor), and little controlled (negative-motor or inhibition), by the higher levels—that the lowest centres, and in particular the respiratory, medulla, centre, are in consequence naturally, healthily, more excitable than in older people. Moreover the lowest level in the very young, the new-born, infant, although the most advanced in

²⁰ I think the great liability of very young children to terminal tonic spasms (carpopedal contractions) is owing to incomplete development of this tract, cerebral control is in them easily removed, there being little to "take off"

²¹ Clinical Journal, March 1st, 1893

development of all three levels of the cerebral sub-system, is incompletely developed. It is perhaps partly owing to imperfect development of the cardio-inhibitory centre, or of fibres from it on the vagus (fibres extrinsic downwards) that very young children suffer more from supervenosity than adults do. I say this in consequence of certain remarks by Cohnheim,²² "If the vagi be divided before occluding the trachea, the asphyxia apparently sets in more rapidly in some animals, and certainly the heart invariably becomes much more speedily paralysed than with the vagi intact."

I now consider in outline the Process of Evolution. Strictly we should begin with parts of the body, they make up the lowest level of evolution of the whole organism. I shall deal only with motor evolution, a very arbitrary proceeding since evolution is sensori-motor. I follow Herbert Spencer, using, however, terms more familiar to medical men than he used. Spencer is not answerable for any misinterpretations I may make of his doctrines or for misapplications of any of them.

There are four factors in evolution. In the evolutionary ascent there is (1) Increasing Differentiation (greater Complexity), (2) Increasing Specialisation (greater Definiteness), (3) Increasing Integration (greater Width of representation), and (4) Increasing Cooperation (greater Association).²³

(1) *Differentiation*. There is increasing complexity, greater complexity the higher the level. The lowest motor centres represent all the muscles of the body in few different (p. 83) movements. The middle motor centres represent (re-represent) all the muscles in more numerous and more different movements. The highest motor Centres represent (re-represent) all the muscles in most numerous different movements.²⁴

²² Lectures on General Pathology, New Sydenham Society's Translations, vol. III, p. 1089.

²³ The word comparatively is to be understood here and many other places.

²⁴ By re-represent I mean, as already said or implied earlier in the text, that the middle motor centres represent over again in more complex, &c., ways, what the lowest motor centres have represented in simplest ways and by intermediation of those lowest centres, by re-represent I mean that the highest motor centres represent over again what the middle motor centres (re-representative centres) have represented and by intermediation of

Increasing differentiation is a passage from the simple to the more complex, there arising the higher the level more numerous intermediate degrees of difference between the most different movements represented

(2) *Specialisation* There is increasing definiteness of representation the higher the level The movements represented by the lowest motor centres are for, comparatively, general ends, those represented by the middle motor centres are for more particular ends, and those represented by the highest motor centres are for most particular ends

Increasing specialisation is a passage from the general or indefinite to the special or definite, there arising the higher the level more numerous intermediate degree of definiteness

(3) *Integration* There is increasing width of representation by centres, the higher the level Each of the lowest motor centres represents movements of muscles of some region (representation in detail) Each of the motor centres of the middle level represents movements of muscles of a wider region Each of the (hypothetical) motor centres of the highest level represents movements of a widest region if not of the whole organism

Increasing Integration is a passage from detailed representation, that is representation of a small region by each of a series of centres of a level (lowest) towards, or to, universality of representation, that is representation of nearly all if not all regions by each of a series of centres of a level (highest) It is very important to understand what is meant by Integration ²⁵ It may

those middle motor centres in most complex, &c, ways This being explained, I shall in future use the word represent

²⁵ The formula of evolution implies a doctrine of Localisation, and one very different from the current doctrine of "abrupt" localisation Integration is ignored by the current doctrine It is an exceedingly important factor It is well stated by Dr Mercier, who, dealing with Localisation in an Article, Coma, in *Brain*, January, 1887, p 480, writes "In the lowest centres of all the localisation is no doubt extreme Such centres represent a limited part of the body very strongly, they represent little else, and that little but feebly But in the highest regions each centre represents a large part of the organism preponderatingly, a still larger part in less degree, and the whole of the organism in some degree And in the intermediate centres the representation is intermediate in character, a larger or smaller area being preponderatingly represented, and the halo of partial representation being larger or smaller, while the intensity of the representation is less or more, according as the centre is more or less elevated in the hierarchy of the nervous system "

be roughly said to be an increasing "mixing up", the centres of the middle level "mix up" the detailed representation by the centres of the lowest level, in the centres of the highest level the "mixing up" is so great that each centre or unit represents a great part or the whole of the body

(4) *Cooperation* There is an increasing number of inter-connexions of centres the higher the level. The motor centres of the lowest level have few inter-connexions by fibres²⁶. The motor centres of the middle level have numerous inter-connexions. The motor centres of the highest level have most numerous inter-connexions. There is a greater number of inter-connexions, the higher the level.

Increasing cooperation is a passage from centres (of the lowest level) greatly independent of one another in their operations, to centres (of the highest level) having a more nearly necessary concert with one another in their operations. (There is not only the unity of undifferentiation, but the unity of cooperation of the differentiated.)

I have in an earlier part of this lecture mentioned the Scale of Fits—Lowest, Middle and Highest Level Fits. I now attempt a comparison and contrast between middle level and highest level fits as depending on discharges of levels of the cerebral sub-system of different evolutionary grades, I have nothing to say as to the comparison and contrasts of lowest level with middle level fits. The middle level fits I call epileptiform seizures, they were described by Bravais in 1827,²⁷ no one, nowadays, doubts that there is a discharge-lesion, or perhaps, many would prefer to say "disease," of some part of the so-called motor region (Rolandic region) of the cortex cerebri of one-half of the brain in those cases. Highest level fits are those of the so-called idiopathic epilepsy, or, as I may roughly say, they are "ordinary

²⁶ Although I use the expression "connexion by fibres" any sort of physical junction or any kind of pathway, definite or indefinite, ensuring more or less certain cooperative activity of different nervous elements suffices for the hypothesis mentioned in the text.

²⁷ They are sometimes called "cortical fits," a term I do not use, as I believe that highest level fits (so-called idiopathic epilepsy) are cortical too, a different region of the cortex cerebri being affected in them.

epileptic fits", I suppose that most of these seizures depend on a discharge-lesion of some part of the pre-frontal lobe (motor province of the highest level) of one-half of the brain

The two kinds of fits are examples of *Dissolution being effected* I submit that the differences in the paroxysms of the two kinds are such as might be expected if the evolutionary differences between what I call the motor province of the middle level and that of the highest level are such as were suggested when the Process of Evolution was considered In making these comparisons and contrasts I suppose a very severe fit of each kind, in severest epileptiform and in severest epileptic fits there is universal convulsion, it is an error to suppose that an epileptiform seizure at first partial has, when become universal, "turned into" an epileptic seizure We are obliged to consider seriatim things which occur together

1 (a) An epileptiform seizure begins very locally, (b) an epileptic seizure begins comparatively widely 2 (a) In an epileptiform seizure the commencing spasm is particular, there is in the commonest variety a particular disposition or attitude of the thumb and index finger, (b) in an epileptic seizure there is not such a particularity of onset 3 (a) In an epileptiform seizure the movements of *each region* are (comparatively) slowly developed, (b) in epileptiform seizure they are (comparatively) rapidly developed 4 (2) In an epileptiform seizure the convulsion has a deliberate march, different regions of the body being involved, comparatively distinctly, one after another, the convulsion *becomes* universal gradually, (b) in the epileptic seizure the convulsion has a rapid march, different regions of the body are involved nearly together, the convulsion is universal almost at once In the following two statements it is not meant that what is given after a figure in one is the exact correspondent of what is given after the same figure in the other

Do epileptiform and epileptic seizures, differing in (1) degree of localness of commencing spasm, (2) in degree of particularity of commencing spasm, (3) in degree of approach to simultaneousness of development of movements of *each region* and (4) in degree of approach to contemporaneousness of development of move-

ments of *several* regions, differ in these four ways because they depend on discharges beginning in (some part of) two levels which differ in that their centres or units represent (1) different numbers of more different movements, (2) movements of different degrees of definiteness, (3) movements of regions of different extent, and (4) movements with different degrees of association with one another?

In accord with the foregoing hypothesis is the fact that the difference between the two kinds of fits is not absolute, in the epileptic fit one side of the body is, at least often, affected a little before the other (turning of both eyes and of the head to one side is common) and a little more than the other. Indeed, I think a very rapidly developed epileptiform seizure approaches an epileptic fit in character and that a very slowly developed epileptic fit approaches an epileptiform seizure in character, if so the hypothesis is further supported.

At the close of one Section of his very important work, *L'Épilepsie* (1852), p. 430, Herpin writes "Nous aurons achevé cette longue section, quand nous aurons fait connaître quelques rapports qui existent entre la nature du début et l'intensité plus ou moins grande de l'attaque. Quand la période de crampes ou convulsions partielles initiales est prolongée, l'accès est le plus souvent incomplet ou fort court. Le cri unique et intense marque, au contraire, le début d'un accès violent. Plus la chute est brusque, plus ordinairement l'accès est fort. En résumé *plus le début est long, moins la crise est violente, plus il est instantané, plus l'accès est intense* (Italics in original).

I suppose that in cases of epilepsy and of epileptiform seizures there is a very local discharge-lesion (physiological fulminate) of a few highly unstable cells of one half of the brain. I have thought that there are certain differences in convulsions depending on differences in liberations of energy (p. 84) by nerve cells (nervous discharges). We have in the case of discharge-lesions to consider two things, or two aspects of one thing—quantity of energy liberated, and the rate of its liberation. With regard to convulsions produced partly directly but mainly indirectly by a discharge-lesion, we have to consider the degree of convulsion,

the range of convulsion, and the time in which that range is attained, and particularly whether the onset of the fit is "deliberate" or "sudden" In two liberations of equal qualities of energy but at different rates there is the same momentum or quantity of motion, but the *force* of the more rapid, but shorter, liberation of energy will be greater than that of the slower and longer liberation Using an old-fashioned term, the more rapid the discharge the more "intense" is the fit (*vide supra*, Herpin)²⁸ The more rapid the liberation of energy (primary discharge) by a discharge-lesion, the more numerous and greater the resistances which will be overcome, the more numerous collateral, healthy, comparatively stable, elements will be compelled to discharge (secondary discharges), and thus the more the amount of convulsion and the greater its range What is said bears on the interpretation of paralysis after convulsion

I have suggested that the degree and range of paralysis after convulsion is proportionate to both the quantity and rate of the discharge in the paroxysm I will now consider one aspect of this question, ignorance of physics will I fear prevent my dealing with the subject properly It is well known that a ligature above (and some other disturbances of) a part of the body in which an epileptiform convulsion is starting, will sometimes arrest the convulsion, or will keep the spasm more local I suppose the procedure mentioned leads to inhibition of the cortical cells discharging, stops their discharge or makes it slower (fewer nervous impulses in a given time) A consequence of the slackening of the discharge of the fulminate is that it overcomes the resistance of fewer collateral normal nerve cells, the answering convulsion being correspondingly limited, yet, in the narrowed limit, the convulsion is greater in degree, consequent on concentration of what discharge there is upon a part, the subsequent temporary paralysis is, I have thought, more limited, but greater in degree locally, and lasts longer I have recorded²⁹ the case of a man who had fits beginning in his left foot "The first shock

²⁸ On a pu voir que, dans les attaques les plus intenses de notre échelle, les convulsions sont générales Herpin De L'Epilepsie, p 450

²⁹ *The Lancet*, May 16th, 1868

was from the base of the great toe," he became insensible and was not, he told me, locally paralysed after the paroxysms. At length he found that he could stop his fits, prevent the convulsion spreading, or rather that his son could, by rubbing the calf (the spasm being by the procedures adopted kept to the leg), *then the leg was always temporarily paralysed after each seizure*. I think it possible that in another case of an epileptiform seizure beginning in the left foot³⁰ my procedures to stop a fit I witnessed caused the spasm to be more limited in range, almost confined to the leg, and that consequently there was decided temporary local paralysis, of the leg, after the seizure, the arm was very slightly paralysed also. He had had three seizures before the one I saw, each beginning in his left foot, in the first and second he lost consciousness, in the third he did not, I got no account of any decided paralysis after the first three seizures, but he said he felt weak after the attacks and if this weakness were local, he was locally paralysed. But I see no warrant for concluding that he had any notable local paralysis after the first three attacks, after the fourth attack, the one I witnessed, there was great and lengthy (four hours) paralysis of the leg. The patient seemed to think that my attempts to stop the fit were the cause of his being paralysed after it. Had I not interfered, he would, I think, have had spasm less in amount *locally*, less in the leg, but greater in amount spread widely and rapidly, possibly universal convulsion, after the paroxysm he would have had, I suppose, a slighter degree of local, leg, paralysis, but more paralysis widespread. I consider that, if I did keep the convulsion limited and if I were thus the cause of that limb being so much paralysed after the attack, I did the patient good service. It is better to have convulsion limited to a leg than less convulsion of that part, but spreading to the respiratory muscles, and possibly all over the body. It is true that there may be more *local* paralysis when the seizure is limited in range, but then such paralysis is temporary. Surely it is better to have temporary paralysis even of much of one side of the body after a fit than to

³⁰ Medical Times and Gazette, Feb 12th, 1888

have that condition of the highest cerebral centres which loss of consciousness implies. I think the patient referred to had more local paralysis, but less paralysis altogether than he would have had had I not tried to stop his fit.

I admit difficulties in the way of the hypothesis I have stated as the effects of the rate of discharge in a fit, on the degree and range of paralysis after the fit. It is right to draw attention to what a great authority in neurology, Sir William Gowers, has said against it. I refer to his important work on Epilepsy (p. 102). In his "Diseases of the Nervous System,"³¹ he writes "After a severe fit, it (paralysis) may be due to exhaustion of the nerve-elements, but the transient palsy that succeeds a very slight fit must be ascribed to inhibition of the motor centres. Just as such a discharge in the sensory centre may, as we have seen, set up secondary discharge in the motor centre, so it may, when slight, merely inhibit the centre." I believe, but I dare not be sure, that I have always applied my hypothesis to cases of paralysis *following convulsions*, I do so in this lecture. It is possible that, as Gowers supposes, sensory discharges may inhibit motor centres in those paroxysms in which there is little or no spasm and in which there is much post-paroxysmal paralysis.

I now make some general remarks on Dissolution. Dissolution from disease is rarely if ever the exact reverse of Evolution. Thus, in progressive muscular atrophy, in which malady *motor* centres of the lowest level are involved, there cannot be the exact reverse of evolution which is on a *sensory-motor* basis. Another example, there are different kinds of insanity, to mention two, general paralysis and melancholia, as they must be owing to disease of different regions of the highest level (different parts of the "mental centres") neither of them is a Dissolution the exact reversal of Evolution of the whole level.

When we consider nervous maladies as Dissolutions we have to bear in mind not only the Dissolution, that which is effected by disease in the sense of pathological change, but also the Evolution going on in the undamaged, healthy, remainder. There

³¹ Second edition, p. 743

are some obvious exceptions to the implication that a range of evolution remains in cases of Dissolution, for example, in absolute dementia, if there be such a thing, there is no lower range of evolution remaining in the highest level, all "layers" of it being functionless. Taking the case of insanity for illustration, and ignoring that extreme degree of it which I have spoken of as absolute dementia, I submit that whilst the negative affection of consciousness in every insanity answers to the Dissolution, loss of so much, the positive mental symptoms, illusions, delusions, &c., signify Evolution going on in the healthy remainder, going on in parts which disease has spared, going on on a lower, but not the highest, range of Evolution of the highest level.

I wish to draw particular attention to another matter regarding Evolution and Dissolution in nervous maladies. I have elsewhere spoken of Dissolution by disease as beginning in the latest developed, this, I now think, may be true or untrue according to the meaning we give to the word "developed." It is notorious that the hand is frequently affected in nervous maladies, the thumb and index finger often suffer. Yet, embryologically, the hand appears before the other segments of the arm, and the radial digits appear before the ulnar fingers. It is well known that the hand is a part of the body which is late in coming into full use. With regard to Dissolution exemplified by morbid affections of this region of the body, I would now say that Dissolution begins in the "earliest appearing," but "latest perfected" parts of the arm. I am too ignorant of Embryology to be able to say how far the same principle may apply—whether or not the latest perfected is as a rule the earliest or the early appearing, appearing in a more or less rudimentary degree or crude form before it is perfected.³²

Dissolution is from the least towards the most organised. It is necessary here to remark that such an expression as "high

³² Spencer writes, *Principles of Sociology*, vol. 1, p. 472: "it happens that entire organs which, during the serial genesis of the type, came comparatively late, come in the evolving individual comparatively soon. This, which Professor Haeckel has called heterochrony, is shown us in the early marking out of the brain in a mammalian embryo, though in the lowest vertebrate animal, no brain ever exists."

organisation" is not, when used with regard to the nervous system, synonymous with most complex, &c , indeed, the most complex, &c , nervous arrangements, centres and (p 85) levels, are the least organised, the most simple are the most organised Thus the centres of the lowest level are much more strongly organised than those of the highest level are It is very important to bear this in mind A man deeply comatose from sucking raw spirits out of a cask and whose highest level, or presumably most of it, is rendered quite functionless by much alcohol rapidly taken, recovers because the "vital" centres of his lowest level are very strongly organised and go on working, although imperfectly, when the comparatively weakly organised centres of his highest level have "given out" If the "vital" centres of the lowest level were not strongly organised at birth life would not be possible, if the centres of the highest level ("mental centres") were not little organised *and therefore very modifiable* we could only with difficulty and imperfectly adjust ourselves to new circumstances and should make few new acquirements The highest level is supposed to be less and less organised and therefore less and less automatic, the higher its "layers", the highest layers are the least organised, least automatic,³³ and their activity is attended by most vivid consciousness, they are most easily rendered functionless by certain injurious agencies, such as alcohol, by great heat in febrile diseases, &c

There is another relation of the several levels to one another, the consideration of which is very important, from a medical point of view Schroeder van der Kolk³⁴ has stated that the spinal cord of a sturgeon weighing 120 lb is about equal in thickness to that of a frog, he says "that the more complicated their (animals) movements, the more numerous will be the ganglionic cells with their several groups, and thicker will be the anterior horns and the masses of grey substance in the spinal cord" Herbert Spencer has written to the same effect, but more gen-

³³ We should not speak of degrees from most automatic to most voluntary, but of degrees from most to least automatic

³⁴ On the Spinal Cord and Medulla Oblongata and on Epilepsy, p 64, New Sydenham Society's Translation

erally³⁵ The principle involved is well illustrated by Horsley and Schafer³⁶ when speaking of what they call the trunk area of the motor region of the cortex cerebri, they write: "It certainly is not a little remarkable that the numerous and powerful muscles of the spine should be governed from so small a portion of the cerebral cortex, but it is to be remembered that the movements of which the spine is capable are comparatively few and simple "

It would seem that motor centres are voluminous—contain more cells and fibres—not in proportion *to the size of the muscles* they represent, but in proportion *to the number of different movements of muscles* which they represent, the higher the level the more numerous different movements does it represent, along, of course, with corresponding impressions (sensory element) which I am neglecting, hence a greater number of cells and fibres the higher the level It is clear that the cerebral hemispheres are much more voluminous than all the centres of the lowest level put together are, moreover, there are the centres of the cerebellum which, or some of which, it has been suggested, represent by intermediation of the lowest level very many different movements of all parts of the body, most especially movements of large and powerful muscles those of the trunk and legs (locomotion) I now, however, deal with the cerebral sub-system only

I think we may say that the higher the level (I shall limit consideration to the motor provinces of the levels), the more tolerable is destruction of a given number of cells (destruction-lesion) and the more intolerable is high instability, instability far above normal, of an equal number of cells (discharge-lesion) For the higher the level the greater is its "intricacy" (See part of the lecture on the Process of Evolution for qualifications of what follows) To take the case of destruction-lesions first Suppose destruction of so much (1) grey matter of motor centres of the lowest level as would paralyse one arm completely, I submit that a loss of (2) the same quantity of grey matter of the "arm centre," a motor centre of the middle level, would produce only weakness of the limb, and that (3) a loss of the

³⁵ Principles of Psychology, vol 1, p 35 and 55

³⁶ Philosophical Transactions of the Royal Society, vol 129, 1888, B

same quantity of grey matter of the motor province of the highest level, of any part of it I may say, would produce scarcely any, if any, *obvious* effect on the arm. If what was said of the evolutionary process be true, it is clear that the higher the level the greater the Compensation for a destruction-lesion, or, as I just said, the more tolerable is that kind of lesion. It is quite otherwise in the case of discharge-lesions, or, synonymously, physiological fulminates, indeed, there can be no compensation³⁷ for a discharge-lesion. I have nothing definite to say of persistent discharge-lesions of the lowest level, although I suppose there are such lesions in cases of the third division of lowest level fits, those in man which are analogous to the fits produced in guinea-pigs by Brown-Sequard's method. I only deal with effects of persisting discharge-lesions of parts of the middle and highest levels, that is, with epileptiform seizures (the epilepsy described by Bravais, 1827) and with seizures of so-called idiopathic epilepsy. The highly unstable cells of a discharge-lesion (or fulminate) remain connected with other (no doubt, in gradually increasing degrees of indirectness, with all other) normal, comparatively stable, cells of the level of which such a lesion is a small part, and most of the fit is beyond question owing to secondary discharges (induced by the primary discharge, that of the fulminate) of these normal cells, with next discharge, of course, of cells of a lower level or of lower levels. The higher the level the more numerous are the normal cells which, upon discharge of the local fulminate, can be compelled to Cooperate in Excess, since the higher the level the more "intricate" it is, there being the greater number of fibres (intrinsic elements) inter-connecting cells of the level, as well as a great number of fibres to cells of lower levels (fibres extrinsic downwards). Cooperation in Excess is, so to say, Compensation Inverted. The two things Compensation for a destruction-lesion and Cooperation in excess for a discharge-lesion are to be carefully considered with regard to principles of Localisation. The motor province of the highest

³⁷ Perhaps the highly unstable cells of a discharge-lesion are useless for *normal* function, for this uselessness there may be compensation. In the text I am speaking of the cells of a discharge-lesion, on the occasions when they are excessively functioning.

level (pre-frontal lobe) is not more, or not much more, voluminous than is the motor province of the middle level, I now consider this matter

Evolution is not an "even process," not one to be exactly symbolised by the raising of an expression to a higher power, by what is called Involution in algebra. If I may put it so, increasing evolution in the nervous system may, at least in some cases, be likened to the raising of some parts of an expression to a higher power than other parts of that expression are raised to. From theoretical considerations I think that in man the motor province of the highest level, a division of the "mental centres," represents very many movements of parts of the body which have small muscles,³⁸ and that it represents comparatively very few movements of parts having large muscles. If so it especially represents most complex, &c, movements of the ocular muscles, of the muscles of the hands, and of those of the tongue, lips and palate, these are movements represented (of course, with corresponding sensory elements) in the physical basis of visual and tactual ideas and of words in the highest level ("mental centres")

The main elements of that part of mind which is commonly distinguished as intellect from the other part called emotion or feeling, are visual and tactual ideas and words. Much the greater part of mentation, both in the sane and the insane, is carried on in Visual ideas, if all Visual ideas were cleared out of a man's mind he would be practically mindless. Further, much mentation is carried on in Tactual ideas. Herbert Spencer³⁹ has pointed out that intelligence in animals is proportionate to the development of tactual organs, to use his words, "a highly elaborated tactual apparatus comes to be the uniform accompaniment of superior intelligence." He writes⁴⁰ that "tactual impressions are those into which all other impressions have to be translated before their meanings can be known", again (p 362) he writes "that the most far-reaching cognitions, and inferences the most

³⁸ There are certain qualifications to be given to the expression "small muscles" for which I refer to my second Lumleian Lecture, *The Lancet*, April 5th, 1890, p 758

³⁹ *Principles of Psychology*, vol 1, pp 358 and seq

⁴⁰ *Op cit*, p 358

remote from perception, have their roots in the definitely combined impressions which the human hands can receive" In this regard we have also to bear well in mind that movements of the hand and arm serve in very many important "voluntary" operations, in manipulations, such as writing, &c I have suggested⁴¹ that the nervous arrangements in the highest level for such movements have psychical concomitants (so-called "ideas of (p 86) movements") Duchenne insists strongly on the high importance of the flexor longus pollicis in man—"qu'il aide, en un mot, à l'exécution des travaux manuels qui sont à la hauteur de son intelligence supérieure"⁴² The thumb has eight muscles, it and the index finger together are "the most intelligent parts" of the body As to Words, since speaking is propositionising, I suppose no one denies that they serve in all higher thoughts⁴³ in what has been called conceptual thought I think that the physical bases of the psychical things we call words are audito-articulatory nervous arrangements, and believe that highly complex and special movements of the tongue, lips and palate are represented in the highest level I have neglected emotional manifestations and now deal with them only so far as skeletal muscles are concerned in them Herbert Spencer has some important remarks on the engagement in these manifestations of muscles according to size ⁴⁴ "Muscles which are large, and which can show states of contraction into which they are thrown only by moving limbs or other heavy masses, will yield no signs, while small muscles and those which can move without overcoming great resistances, will visibly respond to this feeble wave"

This evidence points, it is suggested, to the conclusion that the "mental Centres" or, as I say, centres of the highest level, represent vast numbers of movements of parts having small muscles, although few movements of parts having large muscles We have in this connexion to take into account the innumerable combina-

⁴¹ Medical Press and Circular, Aug 30th, 1893

⁴² *Physiologie des Mouvements*, p 251

⁴³ Of course other symbols (pantomimic) in propositions serve in the mentation of untrained deaf-mutes

⁴⁴ *Principles of Psychology*, vol 11, p 542

tions into which visual ideas, tactual ideas, the psychical states concomitant with activities of nervous arrangements of the highest level for manipulatory movements, words and emotions can enter, consider too what is involved on the physical side in our seeming to see solidity and hardness when these are merely inferred. The implication is that there are vast numbers of fibres in the highest level ("mental centres") interconnecting the physical bases of the psychical states mentioned. We may, I think, conclude that the higher level, although not more voluminous, is more "intricate" than is the middle level as that is than the lowest, and consequently that a destruction-lesion of a part of the highest level is much more tolerable than one of an equal quantity of the middle or lowest, the opposite for discharge lesions.

It is interesting that⁴⁵ after amputation of limbs the parts of the lost members which remain spectrally present to the patients are the terminal parts, hand and foot, it must not be forgotten that they can "move" these spectral parts. The sufferers are in most cases unconscious of the part between the phantom hand or foot and the stump, if I may be pardoned the expression, they are "conscious of the parts" having small muscles, or we may say those parts are mentally present to them. This does not show that the intervening parts, those having large muscles, are not represented at all in the highest level, on faradaising nerves of the stump the whole limb "comes back," becomes spectrally present to the patient (Weir Mitchell). Here is some indirect evidence that parts, those of the arm at least, having small muscles are more represented in the highest level than are the parts having large muscles.⁴⁶ Now perhaps will be understood what I meant when I spoke of nervous arrangements in the highest level for manipulatory and other "voluntary" movements having psychical concomitants (so-called "ideas of movement"). In this connexion I draw attention to a very interesting paper by Mr F H Bradley⁴⁷. In introductory remarks Mr Bradley

⁴⁵ Weir Mitchell *Injuries of Nerves*, Chapter xiv, 1872

⁴⁶ It is, however, trusting to this implication, difficult to understand how it is that the foot is so much represented in the highest level (in the "mental centres")

⁴⁷ *Mind*, July, 1894, p. 373, *On the Failure of Movement in Dreams*

asks "Why, when we strive to move in dreams do we not always move?" Perhaps this inability accords with the hypothesis that large movements (those especially engaged in locomotion) are but little represented in the highest level ("mental centres") Mr Bradley makes the interesting remark that dream-movements are easier in some dreams, "thus for example, it is common to move the lips and tongue and fingers," parts having small muscles (I have been told by several people that they can move in dreams)

A man may have a dream in which he cannot do something he earnestly wishes to do—cannot, for example, move away when naked in very awkward circumstances I believe the physical side of this inability to act in a dream is partly because locomotor movements, movements of large muscles, are little represented in the highest level and partly because the discharges of the highest level corresponding to the ideation of the dreamer (incipient action) are not strong enough to overcome the resistance of the motor centres of the middle level, when they become strong enough to do so the patient awakes, or perhaps there is somnambulism The motor centres of the *middle* level which especially represent small muscles, seem, having regard to the researches of Betz, Mierzejewsky and Bevan Lewis, to have most small cells whilst those centres of this level which represent large muscles have many large cells The larger the motor cells of this level the greater resistance, I imagine, do they offer to discharges of motor cells of the highest level I will now consider some parallel conditions from cases of epilepsy, some preliminary remarks are needed

When speaking of dreams we are dealing with (correlative) normal discharges of nervous elements perhaps slightly greater than in waking, when speaking of an epileptic paroxysm we are dealing with a *suddenly occurring* and *excessive* discharge beginning in *part* of the highest level (*vide supra*) This distinction must be well borne in mind, the matter is, however, not simple *After* an epileptic fit there may be elaborate actions and these result, I consider, from discharges which are very much slighter in degree than the excessive discharges productive of the prior paroxysm, the discharges to which the actions answer are, I think, only a

considerable exaggeration, from loss of control, of normal discharges

In some minor fits of epilepsy (so-called idiopathic) there is, speaking clinically, cessation of consciousness and there are very few and slight peripheral effects. This is a very remarkable thing, I suppose the explanation is that the currents from the local discharge-lesion of some small part of the highest level are, on account of the resistance of the motor centres of the middle level, almost confined to the highest level and therefore irradiate widely in it, I think the parts of the body affected in the slight convulsion of such minor seizures are those having small muscles, the cells of the middle centres for them having small cells and being paths of little resistance. I should, however, like to have more precise observations on paroxysms of minor epilepsy before concluding on the nature of the slight convulsions in them. (I am speaking of skeletal muscles not of the musculature of arteries, intestines, &c.) It is well to say here with regard to slight seizures of epilepsy, that it is imperative to distinguish movements properly-so-called, such as of chewing or tasting, twiddling the fingers, &c., from those contentions of many movements, even of limited parts, which we call convulsions.

According to many eminent alienist physicians greater mental deterioration occurs in cases of epilepsy with minor attacks, than in cases with the greater attacks, if this be so it may depend on wide irradiation in the highest level during these slight paroxysms, the discharges being "pent up" in it, and being frequently repeated. Temporary improvement in mind may occur in some epileptics subject to many slight fits after a severe fit. I once congratulated a mother on the fact that her son had not had a severe epileptic fit for a long time, she, however, regretted it saying that a severe fit "cleared his system," whilst the slight fits from their frequency rendered him unable to go to business (What she called "clearing" the system we may call "relieving tension" of the highest level.) Dr Campbell Clark⁴⁸ writes "Experienced and observant attendants will tell you in the

⁴⁸ Mental Diseases, p 227

wards, pointing to individual cases of epileptic excitement, that the patient has only had 'choked-off' fits, and that as soon as a major fit appears the mental symptoms will subside "

What I have said shows that we have to consider nervous centres not only, to speak very roughly, as "reservoirs of energy," but also as "resisting positions", the resistance of a nerve cell has to be overcome before it is discharged. Patients who have long had such minor fits of epilepsy ("idiopathic") as I have just mentioned do not become subject to their worst fits (*les grands maux*) by having seizures of intermediate degrees of severity, some sad day the patient instead of having a minor fit (*le petit mal*) has a very severe one (*le grand mal*). I suppose this means that on that day the cells of the discharge-lesion of the highest (p 87) level had become more numerous or so much more highly unstable as to be able on their discharge to overcome the resistance of, to "break through," the middle motor centres, large as well as small cells, after which the lowest centres would be overcome and discharged (all three levels of the central nervous system are concerned in severe fits of epilepsy—"idiopathic"), finally, the periphery (ento and epi)—lowest level of the whole organism—would be gained.

To return to some states of sleep for a while. Suppose a man is asleep and dreaming, for this double psychical condition of two opposites, there is a corresponding double physical condition, also of two opposites, of the highest level, there is loss of function of, I will suppose, the highest "layer," answering to the negative part of the sleeper's mental condition and there are increased activities of the uncontrolled lower layers which answer to the mentation of his dream. The nervous activities correlative with the mentation of his dream are, I suppose, confined, or nearly confined to his highest level, the nerve currents not being strong enough to overcome the resistance of, or of but few of, the elements of the middle motor centres, there is therefore wide irradiation of these "boxed-up" currents in the highest level. But if the dream becomes very vivid and, correspondingly, the correlative nervous activities very strong, the resistance of the motor centres of the middle (and next that of those of the lowest level)

is overcome, the middle motor centres *being overcome* are *then* paths (downward) of least resistance, the irradiation in the highest level will be much less wide, the dream ceases, or rather its mentation merges into, or gives place to, waking mentation. I will now take a case of somnambulism, sleep with elaborate actions, from this condition, the rule is, nothing is remembered on full awakening. In this case the middle centres are overcome, if they were not (and after them the lowest), there could be no actions, thus the nerve currents are not confined to the highest level and consequently, in comparison with what occurs during a dream, there is less wide irradiation in that level and consequently the dream is very faint, or possibly there is no dream. To say that there is no dream in somnambulism is however to say more than one can know, it is better to say that nothing is remembered from the state of somnambulism on awakening. Here is an old question. Is even deepest sleep ever dreamless? (Leibnitz, Kant, Jouffroy, and Sir W. Hamilton thought sleep was never dreamless.) I feel sure that in somnambulism there are some nervous activities of lower layers of the highest level, determining, by sub-agency of motor centres of lower levels, the elaborate actions of the somnambulist, there may or may not be mentation (a dream unremembered on recovery) attending those activities.

Such relations between the different levels as I have illustrated by different states of sleep are very important with regard to epilepsy, especially a particular variety of it, I mean cases in the minor paroxysms of which there is the so-called intellectual aura, or, as I prefer to call this very elaborate mental condition, the "dreamy state." The patient on coming fully round from his fit and its effects remembers that mental state (else we should get to know nothing about it), but when *after* the fit in which it occurs there is a stage of elaborate actions with so-called loss of consciousness, he remembers nothing from that state. I think it unlikely that the "dreamy state" ceases when the patient begins to act notwithstanding that he remembers nothing from that stage, more likely it diminishes and *becomes more definite*. In some cases there is a traceable community of nature between

the "dreamy state" and the subsequent actions, I have spoken of such cases ⁴⁹ "A patient of mine had the 'dreamy state' of 'being somewhere else', after the paroxysm he, as his friends put it, 'made for the door' " Here I believe is the explanation of so-called Procursive Epilepsy I do not think that anything like an *epileptic* discharge would cause a man to run, the running in these cases begins, I believe when that discharge is over, but before the highest layers of his highest centres rendered functionless by that discharge have become again functionable, the running is determined by activities of lower layers of the highest level (with concomitant dream), with sub-agency of the middle and lowest levels

THE END

⁴⁹Lectures on the Diagnosis of Epilepsy, Medical Times and Gazette, vol 1, 1879, p 143, at p 225 op cit

Index of Volume III

- Adams, Robert, Portrait, 620
 Biography, 621
 Bibliography, 622
 Cases of Diseases of the Heart, 633
- Bernard, Claude, Portrait, 512
 Biography, 513
 Bibliography, 518
 De l'Origine du Sucre, 552
 Du Suc Pancréatique, 581
- Buck, Gurdon, Portrait, 748
 Biography, 749
 Bibliography, 750
 "Extension," 762
 "Fascia," 783
 "Operation," 790
- Cheyne, John, Portrait, 698
 Biography, 699
 Bibliography, 700
 A Case of Apoplexy, 705
- Halsted, William Stewart, Portrait, 384
 Biography, 385
 Bibliography, 388
 Cure of Inguinal Hernia, 412
 Cure of Cancer of Breast, 441
- Hippocrates
 Introduction, iii
 Oath, viii
 On Ancient Medicine, 1
 On Airs, Waters and Places, 19
 The Book of Prognostics, 43
 On Regimen in Acute Diseases, 60
 Of the Epidemics, 100
 On Injuries of the Head, 145
 On the Surgery, 161
 On Fractures, 171
 On the Articulations, 210
 Mochlicus, 278
 Aphorisms, 299
 The Law, 331
 On Ulcers, 333
 On Fistulae, 345
 On Hemorrhoids, 351
 On the Sacred Disease, 355
- Jackson, John Hughlings, Portrait, 888
 Biography, 889
 Bibliography, 890
 Defects of Sight in Brain Disease, 918
 Loss of Speech with Hemiplegia, 927
 Cases of Nerve Disorder, 930
 Divisions of the Central Nervous System, 936
- Panum, Peter Ludwig, Portrait, 802
 Biography, 803
 Bibliography, 804
 Measles on the Faroe Islands in 1846, 829
- Stokes, William, Portrait, 710
 Biography, 711
 Bibliography, 713
 Cases of Permanently Slow Pulse, 727
 Fatty Degeneration of the Heart, 739